

*A webcomic of romance, sarcasm,
math, and language*

xkcd

RANDALL MUNROE

2017

xkcd

2017

a collection of 156 webcomics

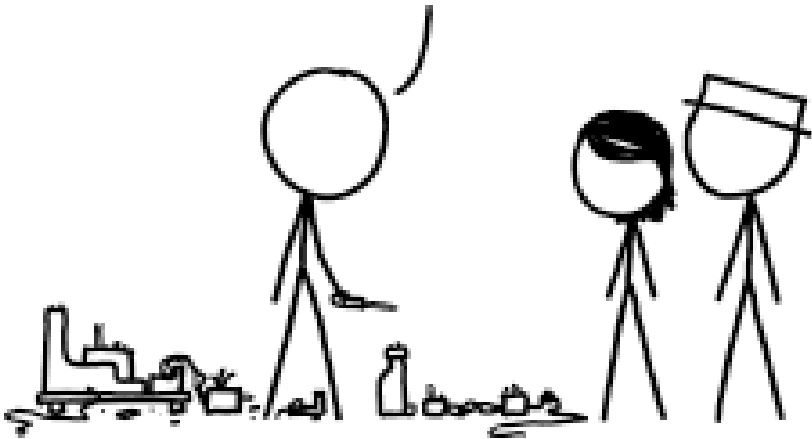
from #1780 to #1935

by Randall Munroe

#1780: Appliance Repair

January 02, 2017

AFTER DISASSEMBLING AND
INSPECTING THE HUMIDIFIER,
I'VE DETERMINED THAT THE
MAIN PROBLEM WITH IT IS THAT
SOMEONE TOOK IT APART.



[holding up a three-phase motor] As you can see here, the problem is that the humidifier I took this from is broken.

Explanation

Cueball is either trying to repair his appliances himself or possibly running an appliance repair service. Although, he isn't doing much in the repairs aspect, as he is diagnosing problems with the appliances that he himself caused. Megan and White Hat (supposedly) call him over to have him fix a humidifier that isn't working. As most repairmen/handyman do, he takes apart the machine to find the root of the problem. However, after this he states the reason it isn't working is because someone took it apart. In this case it was Cueball himself. This would not be very helpful for repairing the appliance.[citation needed]

In the title text it is mentioned that Cueball is holding up a three-phase motor that he has taken from the humidifier. Normally when a person repairing an appliance shows you a part, they are showing you the part of the machine that was broken. In this comic however, Cueball is just showing off a (presumably) random part of the machine and stating that the problem is that the machine it came from is broken – something that was already known and unlikely to help find the root cause of the problem. In addition, it is unlikely that the part being held ever would have worked, because three-phase motors won't work on residential power in North America. Residential humidifiers use single-phase voltage, while three-phase equipment uses three-phase voltage.

This might also be a reference to self reference which is referenced in xkcd sometimes.

#1781: Artifacts

January 04, 2017



I didn't even realize you could **HAVE** a data set made up entirely of outliers.

Explanation

The comic shows Cueball presenting data that was probably gathered in research. It's not clear what type of data it is, but one spike has been highlighted on the graph, despite this spike being apparently no larger than the noise in the data (and is much smaller than the central peak). Cueball seems to have made some kind of mistake in either the statistics or the measurement of the undefined subject of his research, thus his data results in many outliers. The word artifact is a wordplay with two meanings. It is either an archaeological artifact (such as the Holy Grail as in Indiana Jones and the Last Crusade) or a fault in your experiment, where you (usually accidentally) influence the measurement with your equipment or unanticipated environmental factors. These are called error artifacts.

Indiana Jones is (often humorously) cited as being a bad archaeologist. He often destroys the area he is looking for artifacts in, despite the context in which they were found being as or more important, archaeologically, than the artifacts themselves. He does not appear to make any records, carries the artifacts around without any thought for their ancient and fragile nature, and most often ends up losing the artifacts altogether.

An example of an error artifact is the measurement of the force between two charged metal spheres (Coulomb force), where the potential of unearthed nearby objects influences the measurement, thus causing an artifact.

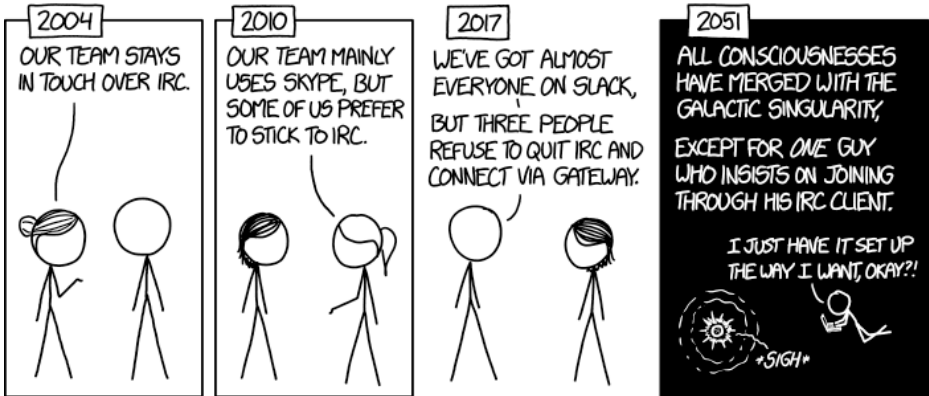
Artifacts have been mentioned before in xkcd, as in 1453: fMRI, where getting into the MRI machine induced unintended effects, such as thoughts of claustrophobia.

The title text refers to the entire data set being "outliers." In statistics, an outlier is an observation point that is distant from other observations. One way to have a data set composed entirely of outliers would be a data set with N points, in a $1/2 N$ -dimensional space, where each point is zero for every dimension except one, unique to itself. The $1/2$ is because there would also be a -1 point. All these points are equidistant from each other.

We could also infer that the accusation is a jab at the fact that the data points are all over the place; a good example of such chaotic data can be seen in 1725: Linear Regression.

#1782: Team Chat

January 06, 2017



2078: He announces that he's finally making the jump from screen+irssi to tmux+weechat.

Explanation

Randall provides us with a – presumably anecdotal – montage of the Internet's changing attitude towards different instant messaging protocols, framed within the context of a team trying to remain in communication while tolerating each others' different tastes.

Although one-on-one "talk" programs date back to 1960s mainframes, Internet Relay Chat (IRC) was one of the first real-time group communication protocols, invented in 1988. While it remains the format on which most later apps were based, the convenience and accessibility of other protocols such as AIM and Skype gradually exceeded IRC in popularity. Many users took to the new environments, but others preferred the old and familiar, hence schisms between groups began to grow.

Skype and Slack are both proprietary centralized communication protocols (usually used through their official clients). Skype focuses mainly on voice communication, be it for personal or business use, and own installable client, while Slack relies almost entirely on text communication, focuses on work communication and works completely well in its own web client, even though official desktop and mobile clients are available as well. Slack also features a huge customizability (bots, plugins) possibly inspired by IRC, and its users need to create communication teams, working inside subdomains at *.slack.com. It is possible to connect to Slack via IRC as well, using a third-party

gateway. (Originally, Slack had a gateway feature, if allowed by the team's admin, but that was turned off in mid 2018, after the publication of this comic.)

Randall here seems to be commenting on the persistence of IRC; while generally considered to be ancient software in comparison to newer and still-competing protocols, its endless customizability has led some people to support it above all others.

Extrapolating for the sake of humor, the joke here lies in a particularly uncommon but memorable type of Internet denizen: even in a far-off distant future where the world's technology has led to a superlative messaging network encompassing all people in some supposed, incredible bliss, there is always — in Randall's vision — going to be That IRC Guy. This might also be a reference to the scenarios in science fiction stories such as Isaac Asimov's concept of Galaxia in the Foundation novels, or the concept of a merged human-computer intelligence as in "The Last Question", the concept of which is most notably highlighted by this line:

[...] One by one Man fused with AC, each physical body losing its mental identity in a manner that was somehow not a loss but a gain. [...]

In the title text, both `screen` and `tmux` are unix programs that help you multitask while working in terminal, and `irssi` and `weechat` are both communication clients supporting mainly IRC, capable of working in a terminal environment. `Tmux` is a newer and apparently more

user-friendly project, complete with handy menus and titles, while screen is something of an industry standard, but relatively difficult to use – you need to know what you are doing or read help before using it, otherwise you get lost and frustrated. The same it is with the newer, more feature-packed and user-friendly weechat vs industry-standard, harder-to-use irssi.

Basically, that one guy is a hardcore UNIX geek who doesn't use any graphical user interface, and in 2051 he still chooses to use terminal-emulation-based tools.

Timing of this strip follows the release of irssi version 1.0.0.

Randall touched on similar themes earlier in 927: Standards and later in 2365: Messaging Systems.

#1783: Emails

January 09, 2017



Hey Rob, sorry it took me a while to get back to you! Sure, I'd love to see **WALL-E** opening weekend! Are you still doing that, or...?

Explanation

In this rather late New Year comic (January 9th), Megan asks Cueball if he has any New Year's resolutions. New Year's is, to many people, a time for thinking about the year and coming up with resolutions to improve themselves. These kinds of resolutions hardly ever work.

Cueball replies that he has one resolution. It's to finish reading and replying to his backlog of emails from 2008, 9 years prior to this comic. He obviously does not read his email when they arrive in his inbox, and he now vows to at least get those e-mails from 9 years ago read.

As he further states in the caption below, he now (finally) begins to doubt his method for replying to e-mails, since his backlog now approaches 10 years. Some would probably say he should have found this out when his backlog approached 10 days, or at least when it reached a month.

A common technique for some more productive or efficient users of email is to batch reply to email instead of replying to each one individually as they come. The principle is that setting aside specific times to reply instead of always being "on call" gives the messages the attention they deserve while avoiding the urge to constantly check your email when you should be doing important work. Such a technique could be to check and answer all your emails once a day, or once a week, for instance and allocating a specific amount of time like one

hour every day to do so. It is unlikely that somebody would wait years to start the task of checking emails, so obviously the time reserved per unit of time is way too short, if even existing. This would create a backlog of emails, that could soon be so large it would take years to catch up to the e-mail you just got right now.

Another technique for efficient people is not to answer certain e-mails; if a subject really is important, the sender will send a reminder a few days later. (If he does not, the sender can be presumed to have solved the problem himself, saving lots of time on the receiver's side. Of course then you have to check your e-mails to realize if someone has sent a reminder.) Cueball has possibly used this technique on a friend's request, but became remorseful after nine years.

The title text is a reply to an email in which Rob wished to see the movie WALL-E, a film that came out in 2008, with Cueball during its opening weekend. However, the opening weekend is now far in the past, and yet Cueball doesn't realize it and trails off with "are you still doing that, or...?" Mentioning the release of a popular movie and then making it clear that it will soon be ten years ago that the movie came out, feels a lot like a hidden comic to make one feel old, but it may be stretching it to include this directly in that category. But it is a technique often used by Randall, quite clearly in most of that category, for instance 891: Movie Ages.

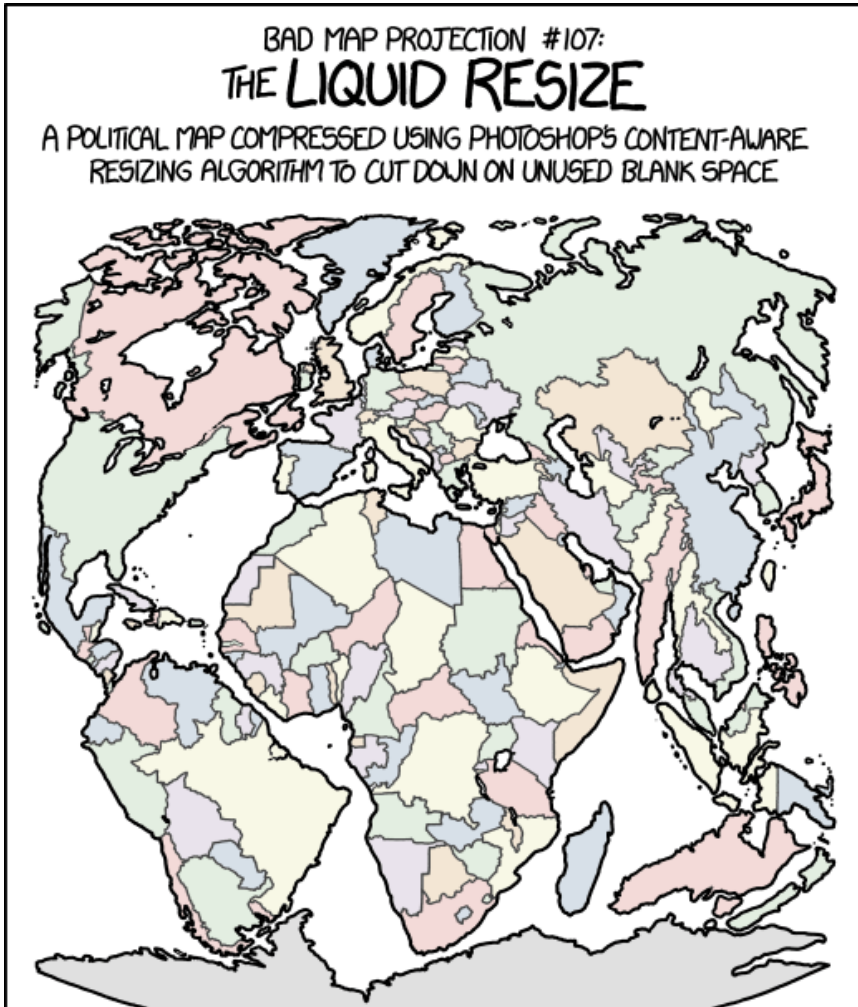
A real (and useful[citation needed]) New Year's resolution would involve trying to answer his emails as

they arrive (instead of spending any more time on years old emails), which would have avoided the mess he's currently in, and will stop it from getting worse in the future.

In this comic Cueball may represent Randall. He receives so many e-mail due to the xkcd comic that he may have a hard time going through them all. Then there is his what if? email, and possibly many more. Hopefully he has a separate e-mail for friends that wish to send him a request for going to the opening of new recent movie. On the about page on xkcd he does write the following for one of the e-mails he cites as contact:

#1784: Bad Map Projection: Liquid Resize

January 11, 2017



This map preserves the shapes of Tissot's indicatrices pretty well, as long as you draw them in before running the resize.

Explanation

This is the first comic in the series of Bad Map Projections presenting Bad map projection #107: The Liquid Resize. This turned into a series when 1799: Bad Map Projection: Time Zones (#79), was released just a bit more than a month after this one.

There is no perfect way to draw a map of the world on a flat piece of paper. Each one will introduce a different type of distortion, and the best projection for a given situation is sometimes disputed. Randall previously explored 12 different projections in 977: Map Projections, and expressed his disdain for some types he sees as less efficient but whose users feel superior. None of them are truly perfect as any 2D map projection will always distort in a way the spherical reality, and a map projection that is useful for one aspect (like navigation, geographical shapes and masses visualization, etc.) will not be so for all the others. Local maps of smaller areas can be quite accurate, but the idea of both these map projection comics is to map the entire globe on a flat surface.

There are many other projections than the 12 from the previous map projection comic, and Randall seems to have listed at least 358 under the label "Bad Map Projections." The Liquid Resize map projection is not only useless for most map applications -- as the size, shape, and position of most countries are very distorted -- but its creation includes two steps which are outright

counterproductive.

First, this method needs a planar map projection as its starting point, thus compounding the problems right off the bat. Planar projections are relatively accurate near the center but heavily distorted toward the edges. A famous example of a planar projection is the logo of the United Nations. Planar projections are basically only useful for 3D graphics rendering, if the user needs a quick, inexpensive way to store map textures that will later be attached to a sphere.

Second, the map uses Photoshop's content aware resizing tool, a very questionable choice.[citation needed] The content aware resizing tool resizes images by identifying what it thinks are important details and preserving these, while shrinking or stretching less detailed areas. For example, when used on a face, the algorithm detects that the eyes and mouth are important details and tries to keep these in place, while stretching the skin around it. When applied to a map, this means that areas with lots of countries - and therefore lots of detail - such as Europe, West Africa, the Eastern Mediterranean and Central America/the Caribbean are relatively unchanged, while big countries like India, China and the US are very warped. The choices that the resizing tool makes are also dependent on the exact visual features of the original map, such as the choice of not having any topography or infrastructure drawn on, or not including a latitude/longitude grid, so what areas are deemed as unimportant is even more arbitrary than it would be on, say, a photographic picture of the Earth.

Bad content aware scaling is already a meme. This projection does do a good job, however, of making almost every country clearly visible and indicating which countries are neighbors. Using a Photoshop tool for a task it is not intended for was also used in 1685: Patch where a GNU patch tool was replaced with Adobe Photoshop's patch tool to compile code.

South America would fit into Africa almost as it did in the era of the super-continent Pangaea, but the shape of Brazil is morphed around in preserving the island nation São Tomé and Príncipe.

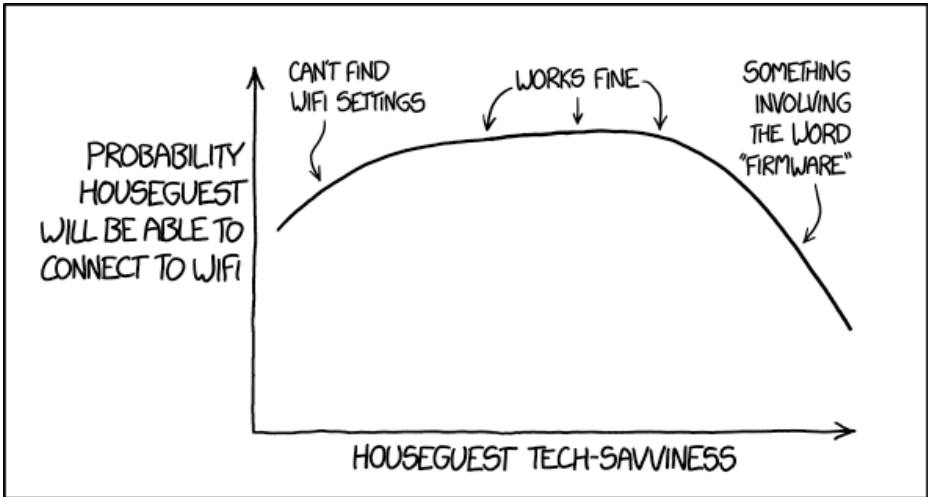
Tissot's indicatrices are equally sized small circles overlaid on a globe to show the distortion of a particular map projection; if the map distortion distorts the shapes or areas of countries, it will do the same to the circles. The title text suggests that the shapes of Tissot's indicatrices would be pretty well preserved by the Liquid Resize transformation, 'as long as you draw them in before running the resize'. This is a joke. "Drawing them in before running the resize" means that a different projection would be generated (probably preserving the indicatrices themselves), making the use of the indicatrices meaningless, sort of like cheating. In fact by drawing them small enough there will be no resizing at all.

It is unknown if Randall would include common map projections like those in 977: Map Projections among his "Bad Map Projections". It would be reasonable to do so, since all 2D projections of the surface of a 3D sphere will

be bad in certain respects. The next comic's projections Time Zones has #79, and could be concluded as being less bad than this one, which also seems realistic as that map has a slightly more reasonable use case than this one.

#1785: Wifi

January 13, 2017



Further out to the right, it works correctly, but the reason it works still involves the word 'firmware.'

Explanation

This comic shows the supposed probability that a guest will be able to connect to the owner's Wi-Fi in graph form. Connecting to a new Wi-Fi network is a fairly simple operation that most people can perform, typically only requiring selecting the correct network name on a settings screen, then entering a password.

The graph starts with tech-illiterate people who don't even know how to control their Wi-Fi connection ("can't find wifi settings"). This group has slightly lower than normal probability of connecting successfully, since they would not know what to do if left alone. However, they still have a reasonable chance to connect as long as someone is available to help them. Once the initial setup is done, they can continue using the connection without any technical knowledge or intervention.

The average case in the middle of the graph represents typical users who simply wish to connect and gain Internet access ("works fine"). This group of users have enough knowledge to be able to connect and are then satisfied with the connection just working. Since networking devices use a standard protocol to communicate behind the scenes, users typically will not experience any issues.

Finally, the large drop in the graph on the right-hand side is explained by "something involving the word 'firmware'". Firmware is programming which operates a

device at the lowest level, typically stored in a ROM or an EEPROM/flash. Both Wi-Fi routers and guest's devices (smartphones, tablets, computers) have firmware. Modifying the firmware can have certain benefits, for example to gain features that aren't included in the base product. Also, especially for newly adopted wireless standards (such as, most recently, IEEE 802.11ac), incompatible interpretations of the standard may prevent devices from different manufacturers from communicating reliably or at full speed, requiring firmware changes to patch the issues. However, working with firmware requires a great deal of technical knowledge, and can be quite risky for people without experience. Not all custom firmware will interoperate correctly with all devices. Technical issues with custom firmware can also be harder to fix due to lack of support from the device manufacturer. In the worst case, installing the wrong firmware, or any errors or glitches in the process, can even leave devices bricked. It's likely that the sharp dropoff in the graph is caused by inexperienced users who know "just enough" to want to modify their firmware, but don't know how to deal with the multitude of issues that can arise. Particularly for users whose connection was already working fine but nevertheless want to experiment with new firmware, their changes often end up worsening their chances of connecting.

The title text indicates that the curve recovers once users are more experienced, and can consistently install firmware correctly to get a working connection. In such

case, the users are able to enjoy better connections through their firmware changes while avoiding their pitfalls. These experienced users are often able to diagnose and fix connection issues through the appropriate use of firmware, making their chances of connecting even better than the average user.

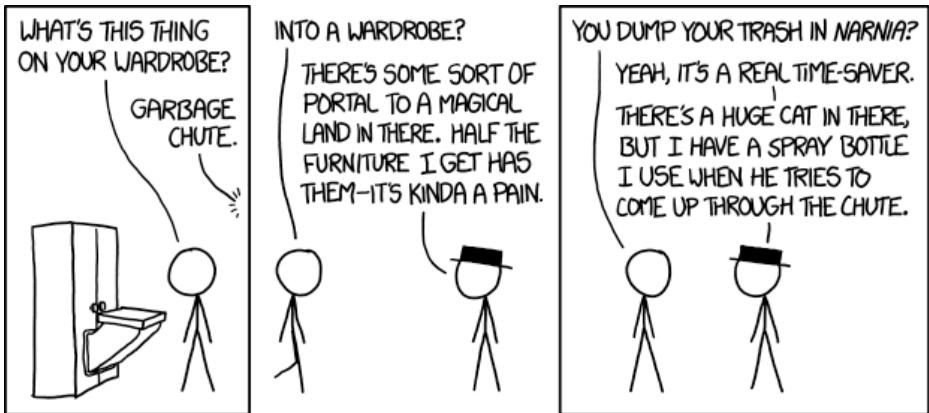
Randall has previously used the title text to add extra info that would not fit in the main graph. This has happened in 388: Fuck Grapefruit, 1242: Scary Names, 2466: In Your Classroom and 1501: Mysteries. The first three have extra data points mentioned there because they are far off the chart, whereas the last has a point whose description would be too long to fit on the chart. All these other graphs are scatter plots, as opposed to this comic being a line-graph.

Computer issues have previously appeared in several xkcd comics, notably 456: Cautionary, where WiFi problems specifically are mentioned in the title text.

The apparent paradox of people knowing more about a subject also having more problems with it is also explored in 1760: TV Problems.

#1786: Trash

January 16, 2017



Plus, time's all weird in there, so most of it probably broke down and decomposed hundreds of years ago. Which reminds me, I've been meaning to get in touch with Yucca Mountain to see if they're interested in a partnership.

Explanation

Black Hat is, once again, thoroughly confusing Cueball (another example of this is 908: The Cloud). This time, when inquired about a chute protruding from his wardrobe, Black Hat explains that it is a garbage chute into another dimension. Apparently these kinds of portals appear on about half of all the furniture that Black Hat buys, and he is somewhat annoyed about it. (This sounds more like something Beret Guy would purchase from "the shop that sells cursed items but when you try to return them the shop is gone", although he would have reacted very differently than Black Hat.) It would be interesting to know whether all the portals lead into the same alternative world/dimension, but it seems Black Hat is not interested in visiting these worlds, instead just being annoyed about his broken furniture. (Given Black Hat's personality, this may well be a practical joke meant to mess with Cueball's head rather than an actual portal to another dimension.)

Cueball quickly realizes this is a reference to *The Lion, the Witch and the Wardrobe*, the first published book in *The Chronicles of Narnia* by C. S. Lewis. In the books, the child characters use different portals to get into the alternative dimension/world of Narnia. The children first find a portal inside an old wardrobe, and use it at least three times to travel into Narnia. Black Hat confirms his trash chute indeed leads to Narnia and explains how this is a great time-saver for him, as he can easily get rid of his trash. The Narnia books are for

children and Narnia is a magical world, so Cueball is appalled to learn that Black Hat dumps his trash there.

A discussion of problems with this comic vs. Narnia chronology is discussed in the trivia section.

The "huge cat" he refers to is Aslan, a magical lion in Narnia. In his lion form he sometimes walks around and watches over Narnia, but not all the time. It is revealed in the last book that he is also the guardian of the other worlds, where he has different names and takes on different appearances, implying he is Jesus, just in Narnia.

Aslan, or any other large cat or inhabitants of such a different world, would probably be really upset that someone is throwing their trash there.[citation needed] He would probably try to stop this by any means necessary, including coming up through a trash chute into another dimension. But because lions are a type of cat (feline), apparently Aslan can be repelled with an ordinary spray bottle. The joke is that this is a technique used to tame small house cats; it would be unlikely to work on a lion, especially on Aslan, since he is fully God and fully feline, so the relative insusceptibility of lions to being repelled by water bottles is combined with divine omnipotence.[citation needed].

In the title text, the fact that time passes much faster in Narnia than on Earth is mentioned. (Time does not pass at a constant rate compared to Earth time.) This could also be the case even if the portal in Black Hat's wardrobe

accessed a different world than Narnia. So everything that is actually pushed to the other side of the portal would be disposed of very efficiently, as the trash could completely decompose within just a few Earth minutes. This would then explain how Black Hat can keep pushing more stuff into the other world: anything sent through the portal will decompose and vanish before he comes with his next load of trash.

The title text mention of Yucca Mountain is a reference to the Yucca Mountain nuclear waste repository, a partially-built nuclear waste repository that has been defunded at the present time. Black Hat wants to contact those that wish to make such a repository and let them dispose of their radioactive waste through his "magical" portal, likely to make a profit for himself. If throwing trash into Narnia is terrible, radioactive waste would be far worse.[citation needed] Of course in Earth time radioactive materials would soon decay back to background levels of radiation. This is thus another jab at all the world's environmental problems, as is also done with all the comics about climate change. This comic could be a take on humans dumping waste in the "endless" oceans, more specifically ocean disposal of radioactive waste. This was done in the past but is now banned, as Earth's oceans are not endless.[citation needed]

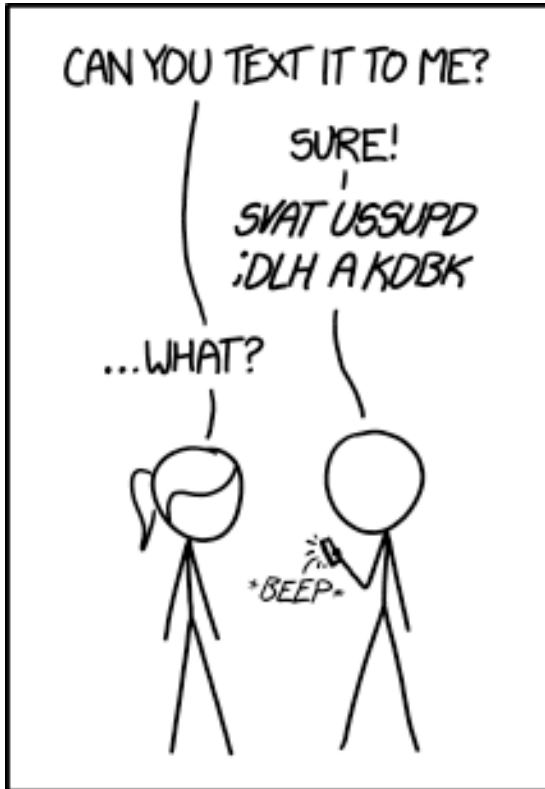
The title text copies the idea behind the Saturday Morning Breakfast Cereal comic from October 15 2014. The button at the bottom of that

comic shows a sad Mr. Tumnus, a faun Lucy meets on her first visit to Narnia, rather than an angry Aslan as suggested in this comic.

The portal through the wardrobe to Narnia was previously featured in 665: Prudence, 969: Delta-P and 821: Five-Minute Comics: Part 3. In the latter, the different passage of time was also mentioned.

#1787: Voice Commands

January 18, 2017



SETTING MY PHONE'S SPEECH
RECOGNITION TO DVORAK WAS A
PAIN AT FIRST, BUT IT'S MORE
EFFICIENT IN THE LONG RUN.

Dvorak words may sound hard to pronounce, but studies show they actually put less stress on the vocal cords.

Explanation

In this comic Cueball has shown Ponytail something relevant to her on his smartphone and she asks if he can send it to her. He agrees but then says something completely incomprehensible to Ponytail, but obviously his phone understands and sends the message with a beep.

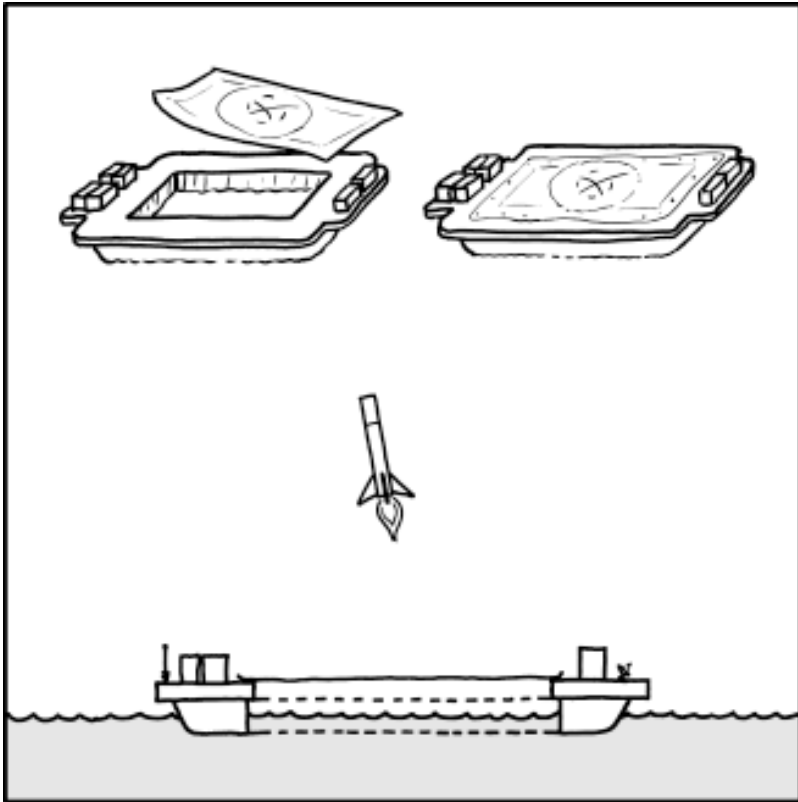
The caption explains that he was speaking as though he was using a QWERTY keyboard layout and writing as it was a Dvorak Simplified Keyboard. In other words, Cueball is saying keys on a Dvorak keyboard and the phone is receiving the spaces on a QWERTY keyboard that each of Cueball's Dvorak letters uses. Cueball can be sure that nobody else will be able to use voice commands on his phone.

The sentence Cueball tells his phone translates to "Okay Google send a text" - he says it as if he were typing the sentence on a Dvorak layout with the keyboard set to a QWERTY layout. How such words would be pronounced is a mystery, as the letters in the words are merely substituted with others with no regard to phonetics; without standardized pronunciations, a speech-to-text program would be useless. To add to the confusion, one of the words in Cueball's sentence includes a semi-colon as one of its letters despite the fact that semi-colons are punctuation rather than phonemes, which only complicates the pronunciation further.

The title text is a reference to the fact that many users of Dvorak keyboards claim they may be hard to learn, but they are more movement efficient and put less stress on your fingers due to less movement. This makes little sense in the scenario set up by the comic, as speaking gibberish using oddly placed vowels would be equally difficult, if not in fact harder, on the vocal cords.[citation needed]

#1788: Barge

January 20, 2017



MY HOBBY: HOLLOWING OUT THE CENTER OF A BARGE, STRETCHING PAPER OVER THE HOLE PAINTED WITH THE SPACEX LOGO, AND LEAVING IT FLOATING OFFSHORE NEAR LAUNCH SITES.

My life goal is to launch a barge into the air and have it land on one of Elon Musk's rockets.

Explanation

This is another comic in the My Hobby series. This one is depicted with three drawings illustrating the core concept and explained in detail in the caption. The launch company SpaceX has developed a reusable rocket system, where the first rocket stage is capable of landing back on either the launch pad or an autonomous spaceport drone ship after launch (See this video displaying both types of landing, from when the sea landing was successful the first time). The landing pads and ships are decorated with a "X" symbol from the SpaceX logo, with the center of the X being the desired landing spot.[citation needed]

Randall imagines creating a similar-looking barge and placing it near the intended landing site, except his barge's platform would be hollow in the middle with only a sheet of paper supporting the part where the rocket would land. Since the paper is painted to look just like the real landing platform, the goal of this setup is presumably to trick a returning first stage rocket into falling into the sea. This is the same concept as the old trapping pit. If a rocket attempts to land on Randall's barge, it will quickly burn through the paper and fall through the hole.

There are several reasons why this setup would not work in real life. First, the rocket actually navigates to the landing site using GPS coordinates shared with the real barge. It does not use cameras to identify its landing site

and will not recognize another barge based solely on a painted logo. Also, a wide area around the rocket's flight path would be restricted around the launch window due to safety concerns. Vessels that are not part of the official launch plan would not be allowed in the area. Even if the fake barge manages to enter the area and does not get removed by authorities, at most it will cause the launch to be cancelled for the day. From a practical perspective, Randall would need to sabotage the actual barge without anyone at SpaceX noticing.

This "my hobby" is probably the most destructive one so far, as it would result in the total loss of the first stage containing nine space rocket engines. The costs associated with buying and remodeling a barge would also likely make this the most expensive hobby, even disregarding the costs to others, though it could potentially be reused if it did not get destroyed by the falling rocket. This hobby seems more appropriate for Black Hat, considering that he is a real classhole, and goes to show that Black Hat is as much part of Randall's personality as Cueball.

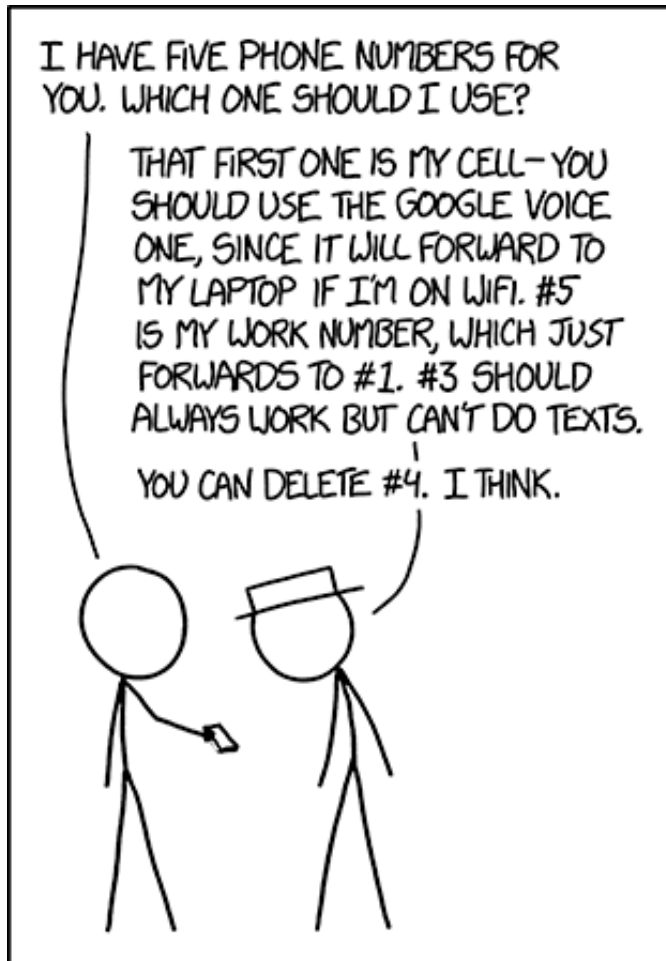
The title text plays on the incredible difficulty of landing a rocket on a barge. Reusing rockets like this is a feat that has only recently become possible, some 60 years after the launch of the first satellite Sputnik 1. SpaceX, founded by Elon Musk, was the first (and so far, only) organization to do so successfully. Blue Origin is also currently testing reusable rockets and achieved landing their first stage before SpaceX, albeit only on land and only with a sub-orbital rocket.

Thus Randall imagines an even more implausible idea of turning the scenario upside down and getting a barge to land on one of Elon Musk's rockets. That would be a spectacular feat of engineering, and the challenges it presents as well as its inherent irony appear to satisfy Randall so much that he would make it into one of his life goals. Launching a barge in the first place would be tremendously difficult - they are big, heavy, and not very aerodynamic. Maneuvering it through the air precisely enough to come down on top of a rocket would be difficult as well. The barge (and probably the rocket) would have to be redesigned if the goal is a soft landing, otherwise the falling barge would certainly destroy the rocket and possibly itself.

This comic was published on the week following SpaceX's Iridium 1 mission, where the first stage of the rocket which delivered 10 satellites into orbit successfully landed on a barge near California. This was filmed from the returning stage 1 and also from further away. More details of the launch are available [here](#). It marked the seventh time SpaceX successfully landed and recovered its booster on a commercial mission.

#1789: Phone Numbers

January 23, 2017



ANOTHER REASON I NEVER CALL PEOPLE.

Texting should work. Unless the message is too long, in which case it gets converted to voicemails, and I think I'm locked out of my voicemail.

Explanation

Cueball, who again represents Randall as given from the caption below the comic, has several phone numbers stored for White Hat under his contact entry on his phone and asks him which number he should generally use.

Often, people who have known each other for a long time may have old information recorded for each other, which may no longer be accurate. For instance, if they know each other from when cell phones were still rather new, they would have had a home phone number also. More and more people have discontinued their land lines and now only keep the cell phone number.

Cueball has five numbers for White Hat, listed here as #1 to #5 as they are numbered in the comic (and not the order he mentions them):

White Hat does say that Cueball should use #2, the Google Voice number. This is a telephone service that provides call forwarding and voicemail services, voice and text messaging for Google customers. Google is updating Google Voice so that is probably the reason for the comic as the update came out rather late on the day when Google made the announcement of the update.

However, he then makes it clear that this will only work when he is online with his laptop on a WiFi connection. This could be his way of saying that he only wishes to

talk to Cueball when he is in such a position.

However, he also explains the other numbers more or less making it clear how he could be reached. And all in all it seems like his cell phone is still the best way to reach him.

Today on smartphones it could be possible in your contact list to save such tedious details about each number (such as "should always work but doesn't accept texts.") But who wishes to do so? Also not all cell phones do have this option, and maybe at best you can only label the numbers as "work", "home" or "cell" but not to the detail that White Hat provides.

In the caption below Randall explains that this kind of trouble with getting the correct number for people he wish to contact is one (another) of more (several?) reasons he never calls people. Today there are so many other methods of getting into contact, also even if texting is out of the questions as well. Skype, messenger, other social networking platforms like Facebook and of course the old way of sending a letter or talking in person...

White Hat's answer reveals a complicated history of communication practices. This cobbled-together personal technology is a common theme for Randall, see 1254: Preferred Chat System for another example, where Voicemail, text and Google Voice is also mentioned (and mixed in with written letter if not real mail).

The title text must refer to one of the five numbers saying that texting works for one of the numbers. This

should then not be #3. It could be the number he says Cueball should use #2, but it seems more likely that it is an amendment to the last I think for #4. Maybe he realizes that this is the number he used to receive text on, when his #3 number was all he had and since that could not receive text he got the number which is now #4.

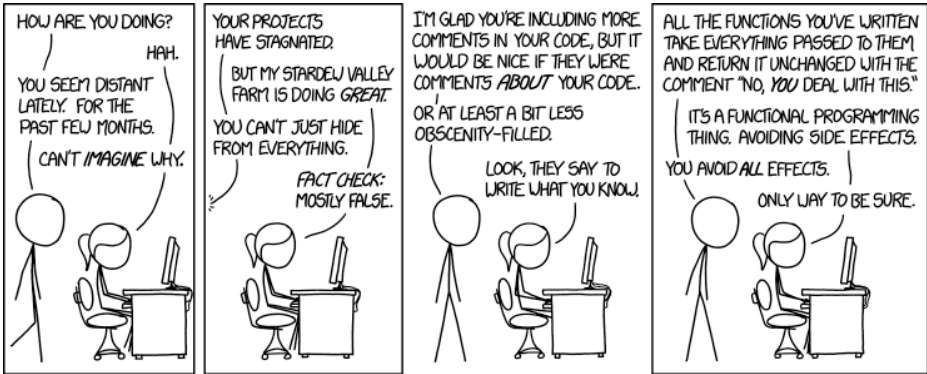
In either case the number he talks about can in fact receive text - but if #4 it can probably not receive phone calls. And then it gets weird because if the text gets too long then the message goes to voicemail. This is of course nonsense as a text message cannot just turn in to a spoken message. (Though of course there are text-to-speech programs, but as this takes up more space than text on a server, it would make no sense).

To cap it up, just in case it did turn into a voicemail, it would not make any difference because White Hat has been locked out of his voicemail.

It is not uncommon that young people never use voicemail and expect people to text them rather than leave a message. This could be a problem for them if "old" people call to let them know of a job they have been offered etc. So it is likely that Randall also jokes about this by letting White Hat be indifferent to having been locked out of his voicemail.

#1790: Sad

January 25, 2017



With the right 90-degree rotation, any effect is a side effect.

Explanation

The comic is about Cueball confronting Ponytail over her recent behavior and poor emotional state over the past few months. While Ponytail doesn't give any details on what's causing it, it can be inferred that she is referring to the recent election of Donald Trump as President of the United States, which happened about 2 months prior to the publication of this comic. This is a common reaction in the United States whenever a new president is elected, as the voters who did not vote for the new/upcoming President will be feeling unpleasant emotions that their chosen candidate did not win, and will want to express these emotions to the wider world. With the advent of the internet, and more recently social media, the expressions of these emotions have grown more common and often more hyperbolic, regardless of the quality of the candidate.

Ponytail has retreated to video games for solace to the point that her real life projects are suffering.

Stardew Valley is a video game in which a player creates and manages a virtual farm. And when Cueball mentions that her projects have stagnated, she retorts that her farm in the game is doing great. A comic with the name of that game was released only two weeks later, 1797: Stardew Valley, indicating that it is indeed Randall who has played this game excessively.

Cueball's statement about not being able to hide from everything is a common one to give to insecure people or

to those trying to run away from their problems. Ponytail's reply is in the form of a PolitiFact reply, claiming (possibly quite truly) that such assertions are mostly false, one of the six options, but it is far from being the worst, thus acknowledging that you can't hide from everything, just mostly. Politifact.com was also the subject of an earlier comic, 1712: Politifact.

In computer programming, comments are pieces of non-functional, descriptive text that programmers include in their code. Typically, they are used as a form of documentation, to make the code easier for other developers to understand. This is why Cueball is glad that Ponytail is at least writing more comments; documentation is something that's often neglected by developers, despite its usefulness. Unfortunately, the comments that Ponytail is putting in her code are not actually about the code at all; she is, presumably, commenting more generally on whatever is troubling her as a way of venting her issues.

Ponytail's reply to "write what you know" is a common piece of advice given to amateur fiction writers - it means that writers tend to write best when they are writing about something they personally know well, since they will have plenty of interesting and useful experience to draw from. However, since Ponytail's comments are full of obscenities, she is sarcastically suggesting that obscenity is all she currently knows.

Functions are reusable pieces of code which developers create to avoid repetition and make the code more

organized. For example, if the code often has to calculate the distance between two points, it makes sense to place that calculation logic into a "calculateDistance" function, which can then just be called whenever it is needed. More generally, a function accepts inputs (eg. the coordinates of two points) and may return an output (eg. the distance between the two points).

Cueball notes, however, that all of the functions Ponytail has written are not actually doing anything with their inputs; they are just returning them straight back again and demanding that the calling code should deal with the problem itself. This makes the functions practically useless. Ponytail sardonically tries to justify this as a functional programming technique by saying that she is "avoiding side effects". A side effect is a situation in programming in which an isolated piece of code changes something about the global state of the program - this can be problematic, as there could be other parts of the code that were not expecting the change, and might behave differently as a result. Their different behavior is a side effect. Sometimes side effects are intentional, but when they are not, they can be tricky to debug and fix.

Functional programming is a programming paradigm in which most or all computation is performed within the scope of self-contained functions, thus avoiding stateful behavior entirely. This removes the possibility of any side effects, since each function only knows what it is told via its inputs, and does not need to be concerned with anything happening outside of itself. Technically, Ponytail is adhering to this paradigm, but only in the

sense that her functions are not doing anything at all, and so cannot have side effects.

Cueball fairly makes this point by noting she is avoiding all effects, to which Ponytail quotes part of a famous quote from Ripley in *Aliens*: I say we take off and nuke the entire site from orbit. It's the only way to be sure. By replying that it's the "only way to be sure" she is thus indirectly saying better safe than sorry, but in reality she just doesn't care about her programming anymore because of her sad state of mind.

The title text is a pun, interpreting the phrase "side effect" literally. If you turn an object 90 degrees along the right axis you will place it on its side, so thus making it a effect of putting something on its side, or a "side effect." You can also turn 90 degrees (along another axis), facing what was previously your side.

#1791: Telescopes: Refractor vs Reflector

January 27, 2017

REFRACTOR



- MORE EXPENSIVE
- LESS COMPACT
- CHROMATIC ABERRATION
- REDUCED LIGHT-GATHERING

REFLECTOR



- CAN'T SEE SPACE VAMPIRES

On the other hand, the refractor's limited light-gathering means it's unable to make out shadow people or the dark god Chernabog.

Explanation

This comic compares two major types of optical telescopes: The refracting telescope and the reflecting telescope. A refracting telescope produces an image with a series of lenses. A reflecting telescope uses mirrors. (A third type, the catadioptric system telescope, uses both mirrors and lenses. It is not shown here.)

It first looks like the comic is simply trying to show that refracting has many flaws, such as expense, size and visibility (see more details below). However, the punchline invalidates these complaints with the (apparently major) flaw listed with the reflecting telescope: It can't see space vampires.

The unstated reason for this is that vampires, according to some cultures, cannot be seen in a mirror. As Space Vampires (like earth vampires) are widely believed to be made up and thus unlikely to interest most stargazers,[citation needed] this complaint is superfluous, and the reflecting telescope effectively has no flaws in comparison to the refracting telescope. There are other problems, though, with reflecting telescopes see details below. (Also there was a big problem in the original version of this comic).

Frequently, however, the right-angle transition at the base of the refractor telescope is done with a prism (an "image erector"). This uses the optical principle of total internal reflection. If mirror-non-appearance of vampires

is due to the interaction of evil with silver, a refractor using a prism could still see vampires. On this theory, however, the reflector could too, since modern astronomical mirrors are coated with aluminum, not silver.

The title text expands on the seeing of supernatural beings, as another negative point is added to the refracting telescope; it apparently can't see Shadow People or the Slavic god Chernabog (sometimes spelled Chernobog), both of which are important although clearly not as important to the telescope's merit as seeing vampires since the fact is only mentioned in the title text. So of course the refracting telescope is still the best. Of course also neither the shadow people nor the god exists[citation needed] so this would likewise be a moot point.

In reality, "shadow people" are a psychological phenomenon wherein humans ascribe human shapes and movements to shadows in dark spaces. Chernobog is a 12th century Slavic deity, whose name translates to black god. His most famous appearance in modern media was in the 1940 Disney movie Fantasia (and Disney merchandise is also almost the only place that his name is spelled as Randall spelled it, with an "a" in the middle). Because shadows are dark and the god is also dark, they cannot be seen by the refracting telescope due to the reduced light-gathering which has already been mentioned as a drawback in the main comic.

Telescopes have been the subject of many comics on

xkcd. Recently one about space telescope was released 1730: Starshade and before that a large "private" telescope was shown in 1522: Astronomy.

The real problems with refracting telescopes[edit]

The basic performance of a telescope is determined by its size: a wider telescope catches more light, making it easier to see faint objects, while a longer telescope is better for high magnification viewing. For looking at stars, the width is actually more important. No matter how much you zoom, a star is too far away to make bigger, but with a big aperture, you can see stars too faint for the naked eye. Planets benefit more from magnification, and distant galaxies need both.

In both respects, it's much easier to make a big reflector telescope than a big refractor one. Since a lens can only be held in place by its edge, the center of a large lens sags due to gravity, distorting the images it produces. This means most refractor telescopes make do with narrow apertures only a couple of inches across. Reflector telescopes are sometimes called "light buckets" because they can have extremely big openings that can catch light from even very faint stars. In addition, because it has a mirror at one end, the reflector telescope is, in effect, twice as long as it appears - a refractor just cannot compete.

Refracting telescopes were only gradually overtaken by reflecting telescopes, however. In the age of great refractors, the largest telescopes in the world were refractors. Reflectors at the time had mirrors surfaced in speculum metal that began to tarnish only months after application, negatively affecting telescope performance. This problem was resolved when it became possible

to surface a mirror in silver, but the problems with refractive lenses persist. Because of this, the largest optical telescopes ever built are reflectors, rather than refractors. In addition, a liquid mirror telescope uses a very cheap, but potentially very large mirror - with the drawback that the telescope can only look straight upwards.

Randall's points:

- More expensive

Grinding a high quality lens is more expensive than producing an equivalent mirror - crown glass, which is needed for good quality telescope lenses, is expensive.

- Less compact

In theory, a refractor could be made compact, but the image quality would be awful, because the lens would have to be extremely fat. The longer the telescope is, the less dramatic the focusing needs to be.

- Chromatic aberration:

In optics, chromatic aberration is an effect resulting from dispersion in which there is a failure of a lens to focus all colors to the same convergence point, producing a rainbow effect around the image familiar to people who wear glasses, and with prisms. It occurs because lenses have different refractive indices for different wavelengths of light. Each color is therefore focused slightly differently by the lens. Mirrors don't have chromatic aberration, since the light is reflected off the front of the mirror. The achromatic lens can reverse this effect, but it's expensive and its

size is limited. Nevertheless, before telescope mirrors were perfected in the early 20th century, the best telescopes were achromatic refractors.

Note that this effect has also been mentioned in relation to photography by Black Hat in 1014: Car Problems, in a completely different context, but shows this is an issue Randall has considered before.

- Reduced light-gathering

Apart from generally needing to be smaller than reflector telescopes a further problem comes from glass defects, striae or small air bubbles trapped within the glass. In addition, glass is opaque to certain wavelengths, and even visible light is dimmed by reflection and absorption when it crosses the air-glass interfaces and passes through the glass itself. All of this reduce the light gathered.

Other problems not mentioned by Randall:

- Suspending a lens

Another important difference (and a big reason why large refracting telescopes don't exist) is that the lens of a refracting telescope has to be supported by the edges, so that light can pass through it. As a result there comes a point where it is no longer feasible to mount a large lens in a telescope due to its weight and the need to support it from the edges. In contrast the mirror of a reflecting telescope is supported from behind, and any support structures for the primary mirror are not in the path of the light. As a result, substantially larger mirrors can be easily mounted and supported. As an additional benefit this behind-the-mirror

support has led to the creation of Adaptive Optics, a technique (which is impossible for refracting telescopes) that allows some of the atmosphere's distortions to be corrected for.

- A mirror can be segmented to make a larger reflecting surface out of smaller (and hence easier to build/mount/support) mirrors. By using a segmented mirror it is possible to build an effective aperture much larger than what could be built even from a single mirror, which is itself much larger than the largest possible lens that might be built for a refracting telescope.

The real problems with reflecting telescope[edit]

It is worth noting that (apart from the vampire problem) a reflecting telescope also has disadvantages compared to a refracting telescope:

- The main disadvantage is that in almost all reflecting telescope designs the focal point is directly in front of the mirror, i.e. in between the mirror and the target of interest.

As a result a secondary mirror is commonly used to direct the focal point somewhere outside of the field of view. However, this secondary mirror (and the struts that support it) will still block part of the field of view - although the focus of the telescope means that the secondary mirror is not visible when looking at distant objects, it will result in diffraction patterns that also hinder the image quality. In fact, this is the source of the diffraction spikes around stars which are commonly seen in astronomical images.

Off-axis telescopes avoid the problem of diffraction from in-path obstructions, they also require larger footprints and more complicated mirror shapes compared to their on-axis

counterparts.

- A reflecting telescope is also harder to maintain:

The mirrors need to be very precisely aligned (this is called collimation), and this can be a laborious process. They may also need re-polishing.

The telescope is open at one end, allowing dust and dirt to enter.

- A reflecting telescope is not very portable. This is why bird-spotters use small refractor telescopes as an easy way to get a closer view of birds.

Despite this disadvantage, reflecting telescopes are used almost exclusively in modern astronomy because of practical limitations in making large refracting telescopes. Very few amateur astronomers use refracting telescopes - nowadays, they mostly exist to con people looking for Christmas presents in department stores (just because a telescope promises 100x zoom doesn't mean the image quality is any good!)

On the other hand, reflecting telescopes help astronomers gaze at Beige Gorgons (mentioned in comic 2360: Common Star Types).

#1792: Bird/Plane/Superman

January 30, 2017

	BIRD	PLANE	SUPERMAN
CARRIES PEOPLE		✓	✓
OFTEN FLIES IN GROUPS	✓	✓	
CREATED IN 20 TH CENTURY		✓	✓
USES MAGNETIC NAVIGATION	✓	✓	
ENTHUSIAST COMMUNITY OBSESSES OVER SMALL COLORATION DETAILS	✓	✓	✓
PREYED ON BY CATS	✓		
OCCASIONAL MID-AIR SEX	✓	✓	✓
EATEN DURING SEASONAL FEASTS	✓		
PROPELLED BY FLAPPING	✓		
SOMETIMES LOSES ABILITY TO FLY, NEEDS TO SUNBATHE TO REGAIN IT	✓		✓
CAN TAKE A PUNCH		✓	✓
MATING BEHAVIOR OFTEN OBSERVED BY A HIDDEN DAVID ATTENBOROUGH	✓		NOT THAT WE KNOW OF
CAPABLE OF INTENTIONALLY RELEASING POOP MID-FLIGHT	✓		✓
CHASES AND EATS BUGS	✓		ONLY WHEN BORED

You can apply special translucent films to your windows to help keep birds/Superman from accidentally flying into them.

Explanation

This comic is a logical comparison of observations to resolve the classic Superman catchphrase of comic book bystanders: "Look, up in the sky... It's a bird!... It's a plane!... It's Superman!", hence the title. Superman, a character originally created for comic books in the 1930s, is an alien with superpowers, including the power of unaided flight; hence the catchphrase exclaiming peoples' amazement.

At the correct distance both birds, planes and the fictional Superman could be mistaken for each other. So this comic aims to help people identify the airborne object by listing on which properties they are alike and on which they are different. This problem was also mentioned in the title text of 1633: Possible Undiscovered Planets, putting Superman near the bird/plane boundary explaining why all this confusion has arisen.

The observations compared range from the mundane to the bizarre and they are listed and explained below in the table. Here some highlights are mentioned, but for all these there are much more detail below.

Some of the mundane observations are that birds don't fly around with people, while Superman can do it, and planes are meant for it; and that the latter two are new "inventions", whereas birds have flown around for millions of years.

Interestingly enough there are actually two observations that have check mark for all three; the first being that there are enthusiasts for all three different flying objects. And these will obsess over small color details in otherwise similar looking objects. The other common thing is that they all may have sex in midair. The possibility of that happening for the all three are discussed in the table.

Three observations only counts for birds, where all those that do not count for birds do count for both planes and superman. Two of these relates to the fact that birds are eaten by cats and humans, the last is that birds flap their wings to fly, the others have other means of flight. There are observations that rules out only planes or only superman, but none that rules out only one of them at the same time as birds are ruled out.

There are also three direct jokes towards the bottom. The first is that David Attenborough may also have observed Superman's mating habits just like he has with birds in the documentary series *The Life of Birds*. The second is that not only birds poop in flight, but that Superman could and would also do so. And the third (and also final observation) is that not only birds chase insects to eat them, but Superman also chases them... though only when he is bored. These last three observations have that in common that the planes are left out of all of them, and the joke is always on Superman. As it has been before in 1384: Krypton and 1394: Superm*n (released just ten comics apart).

The title text refers to black stickers (decals) in the shape

of an easily recognizable predatory bird, like falcons to enhance the visibility of clear glass windows or doors and scare smaller birds away before they crash into the window. This may actually not work very well according to this article: Why Birds Hit Windows, where a falcon decal is also shown. But they are meant to warn birds away and according to this comic they could also prevent Superman from flying through your window (and thus also stop him from possibly just continuing through the building). They are not known to affect the risk of airplanes flying into the building.[citation needed]

Table[\[edit\]](#)

#1793: Soda Sugar Comparisons

February 01, 2017

SODA SUGAR COMPARISONS

SEE ALSO: xkcd.com/1035

IN TERMS OF SUGAR,
DRINKING THIS MUCH SODA...

...IS EQUIVALENT
TO EATING THIS:



The key is portion control, which is why I've switched to eating smaller cans of frosting instead of full bottles.

Explanation

This comic is one of the rare incidences where the title is actually written at the top of the comic. It is also a rare example where an old comic, 1035: Cadbury Eggs, is directly referenced, and even at such a prominent place, albeit in a faded down gray font.

In the comic, Randall compares soda's sugar content to different types of sugary food (see trivia).

The first two panels compare the sugar content of a 20 oz bottle of soda (i.e. 591 mL, thus almost like a half liter bottle) to three Cadbury eggs or one Snickers bar if it had the length of the bottle (9 inches or about 23 cm; most actual Snickers bars are only 4 inches or 10 cm, though the company does manufacture various "king" sizes).

In the next row, Randall compares one bottle of soda each day of a week (seven bottles) to a bottle of cake frosting.

Continuing the estimations in the third row, Randall states that one soda a day for six months will provide the same amount of sugar as four gallons of Skittles (15.1 liters).

Finally, Randall compares three years' worth of daily sodas contains as much sugar as a convenience store's 20-foot (6.1 m) long candy counter.

The reference to Cadbury Eggs is of course the topic of

the referenced comic 1035: Cadbury Eggs, which has the same comparison between soda's sugar content and Cadbury Eggs, as well as comparing a number of other substances to the eggs. So that comic goes the other way around.

In the title text, it is stated that the key is portion control, which sounds normal until it is revealed that the portion control is actually for frosting instead of soda. Eating frosting out of cans is also referenced in the title text of 418: Stove Ownership.

Of interest in this case is that the American Heart Association recommends less than 20-36 grams per day for a sedentary lifestyle (7.5 to 9 MJ per day).

Data[edit]

#1794: Fire

February 03, 2017



Billy Joel briefly detained

Explanation

In the United States and Canada, the term multiple-alarm fire is used to categorize the level of response to fires by local authorities, for instance how many units responded to the alarm. The range typically only goes through a small number of levels: typically a one-alarm fire, two-alarm fire, and three-alarm fire, perhaps up to five or six alarms in some cities, though a ten-alarm fire did occur near where Randall lives two months before the comic.

In the comic, a newspaper front page is shown with its cover story reporting a "50,000-alarm" fire, with a picture of a factory on fire. The humor lies in the unusual use of the term. Instead of indicating the severity of the fire, the number merely indicates the number of alarms being manufactured or stored in the factory at the time of the fire. As indicated by the sound waves, or agitrans, shown in the image, at least some of those alarms appear to have been set off. It is unclear what the causal relationship between the alarms and the fire is. The presence of fire might have activated those alarms (e.g. if they are smoke detectors), the sounding of alarms might have caused the fire to start (e.g. due to workers' attention being diverted from other critical operations), or they might be unrelated events that happened at the same time.

The title text mentions the musician Billy Joel being detained briefly as a suspect for the fire. But he was quickly released, likely because he didn't start the fire,

which is a reference to his song "We Didn't Start the Fire". In other words, Billy Joel's claim that he is not responsible for the fire at the alarm factory has been taken seriously enough for him to be released. Also, the reference is humorous because it compares the literal fire depicted in the factory to the metaphorical fire in people's hearts, in the song. (Or just ignores the fact that the song's fire was metaphorical, for the sake of the joke.)

The incident where Billy Joel got arrested for arson was earlier shown on a similar folded newspaper with only one line of text visible next to an image. This was in comic #4 of 821: Five-Minute Comics: Part 3.

This all fits together as the cover of the single is also a newspaper page with a picture of Billy Joel beneath a headline which is the title of the song. The column of text to the right of the picture is readable here. It is not easy to read it through as some of the text continues outside the image. (The text is a section of the lyrics for the song starting from "Richard Nixon" after the fourth chorus continuing in to the next chorus).

The lyrics of the song is also mentioned in 1775: Things You Learn.

That Billy Joel was released is also obvious since he has also sung the song An Innocent Man, where he sings I am an innocent man, Oh yes I am.

The real culprit might have been Black Hat, for this is exactly like most of his destructive, yet clever, actions.

#1795: All You Can Eat

February 06, 2017



MY HOBBY: GOING OUT AT NIGHT AND ADDING "ALL-YOU-CAN-EAT" TO EVERY STORE'S SIGN

After my absent-mindedness resulted in a bad posterboard-related stomachache, I learned to do the sign-making place last.

Explanation

An all-you-can-eat buffet is when a restaurant will charge you once for entry and then continuously serve you more food at no additional cost until you have eaten all-you-can-eat. Part of the "My Hobby" series, this comic shows Randall wishes to prepend "all-you-can-eat" to random stores.

With the exception of the pet store, which sells pet food, these stores do not sell food, so the very idea of eating their product would be ridiculous for most humans. However, this is what Randall's stunt makes the stores he defaces seem to advertise. Most people would not seriously consider eating the products these stores sell[citation needed] even with the signs suggesting they should, as they sell tires, hair cuts, lumber and flooring and pets.

The "all-you-can-eat" signs obscured the top line for three of the four shops signs. It is not really possible to read the obscured part of the first two signs, although it is likely that the first and last letters in the first sign are A and K. And also since the A is taller than the white sign, this first letter must be larger than the others which do not show above the white sign. There could be room for anything from 8 to many more letters hidden as it can be seen in the second line below that the I's take up much less space than the other letters. But from the letters below it seems likely there were 9 (maybe including a space) if no I's were used resulting in a word or two like

"A _ _ _ _ _ K". All letters in the comic seem to be capital, but Randall sometimes uses small caps, where the first capital letter is larger than the others. This would fit with this sign.

The third sign is fully visible, and it makes sense as it is not a name in the top line but part of the description of what the store provides.

The last sign is clearly readable even though the white sign covers the name at the top, and it says "Kevin's Pet Store". There actually exists a web page with the name "Kevin's Pet Shop", supposedly located in "brownsville texas , CA", but there is very limited information on the page. See more about the use of Kevin in xkcd in the trivia below.

In the title text, Randall seems to have fallen for his own prank. After he puts the "all-you-can-eat" sign onto the signmakers' place, he proceeds to heed his own sign literally and eat the poster boards that he is supposed to make signs from. To remind himself not to make the same mistake again, he tells himself to "do the sign-making place last."

It should also be noted that sometimes "all-you-can-eat" is used to mean "unlimited usage". An all-you-can-eat data plan, for example, is another way to say unlimited data. If this definition of the word were used, all-you-can-eat would mean "unlimited copies of our product for a one time fee". A kapsalon can, arguably, also be called an all-you-can-eat hair salon.

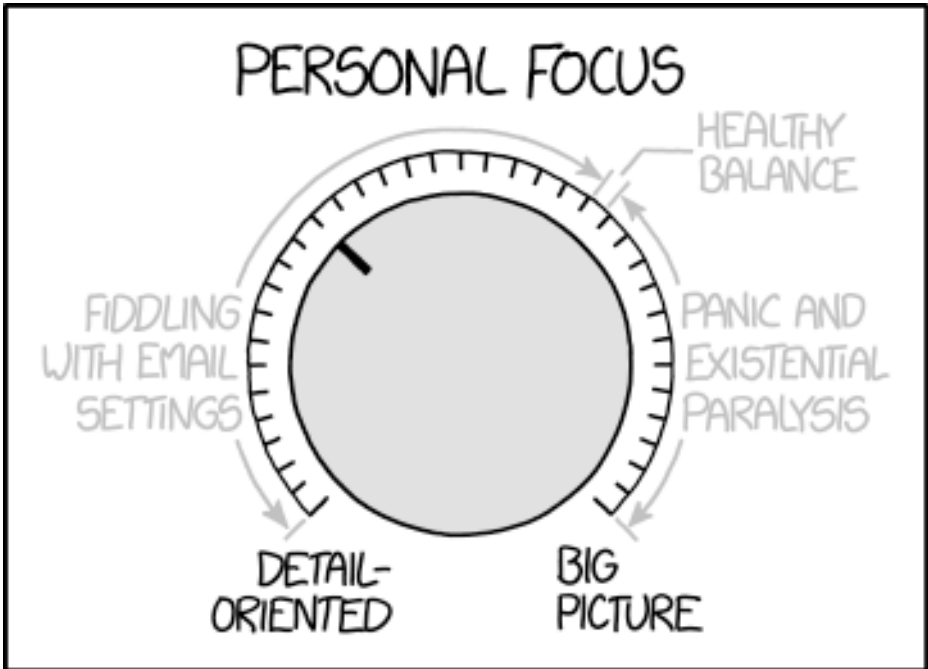
Note that some animals regarded as pets are instead considered food in other cultures; rabbits are commonly kept as pets as well as served as food, dogs are consumed in some areas in eastern Asia, guinea pigs in South America and Africa, and some fictional characters are known for eating cat. Even more normally, a cat owner that wants to buy an "all-you-can-eat" bird feast for their cat would be happy with this last store.

Aside from pets, pet stores also sell pet food, and while frowned upon by some, it is common practice to give human nutrition supplements to pets and vice versa. Some animal snacks are considered very tasty by many people, and there even exist several brands of snacks designed to be eaten both by people and their pets so that the owners could feel somehow closer to their beloved companion. Premium pet foods are made to standards that are no worse than standards for human food, so eating them poses no health risks in the short term - long term, most pet diets would fail to deliver the right balance of nutrients needed by humans.

And it would also be very weird for a pet store to have a buffet in general, even if the food is edible.[citation needed]

#1796: Focus Knob

February 08, 2017



Maybe if I spin it back and forth really fast I can do some kind of pulse-width modulation.

Explanation

The comic is a pun. Normally, a rotary control knob is used for adjusting parameters in instruments, and the parameter "focus" is used to adjust the focal length on microscopes, telescopes, and other lens-based equipment. Here, however, the "focus knob" is used for Randall's personal sense of focus -- that is, how focused he is on his work and productivity, with the extremes of focus being towards Detail-Oriented (small details) and the Big Picture respectively. (A similar knob was used in 1620: Christmas Settings).

The healthy balance, Randall suggests, is focusing mostly towards the Big Picture (two thirds of the way towards the Big Picture between ticks 24 and 25 out of 37), while keeping an eye on the details by still staying one third Detail-Oriented. Focusing too much on the big picture can ensure nothing gets done, leading to panic and existential paralysis. Unfortunately, the range of healthy balance appears to be vanishingly small and difficult to reach; additionally, if we assume the knob can only stop at the little ticks marked along the outside and that the boundaries are not inclusive, there is no way to set it in the window of Healthy Focus.

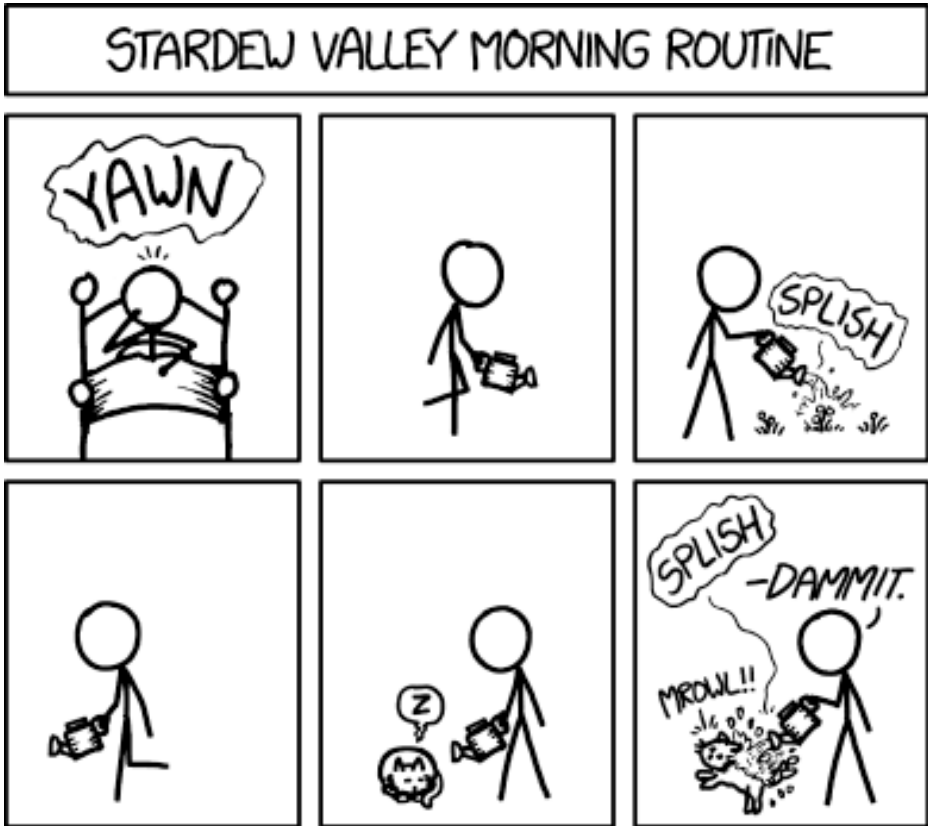
While performing any task, it is easy to get so lost in the details that you forget the big picture. It is also equally easy to think too much about the big picture and make vague plans while missing out on the details. It is clear that at the moment Randall is mainly focusing on the

small details fiddling with his e-mail settings as the knob is set to the 13th tick only just past one third away from Detail-Oriented. He thus seems to try to avoid seeing the big picture right now, since it is his personal knob to set as he wishes.

The joke in the title text relates to Randall's use of an old fashioned analog control, probably a potentiometer, in the graphic versus a more electronically modern and efficient switching system. Randall imagines a replacement control using pulse-width modulation (PWM), which is a technique often used to control the regulation in electronic power supplies or the speed of electric motors with far greater power efficiency than simpler analog controllers. This technique consists of rapidly shifting between fully on and fully off states so that the average is the expected output, but no power is wasted by holding the control mechanism "partially on". For example switching back and forth between 0 and 1, spending half the time in each position will lead to a mean value of 0.5. To code 0.67 (the healthy balance), Randall would have to spend more time in the extreme big picture position (67% of the time) than in the detail-oriented position. In the real world of course, a person switching so radically and completely between attention states might get diagnosed with some sort of mania. But the knob might just be switched between the dividers bordering the healthy zone, creating the perfect balance.

#1797: Stardew Valley

February 10, 2017



I have accidentally watered virtually every person and object in Pelican Town.

Explanation

Stardew Valley is an indie farming simulation role-playing video game created and published by Eric Barone. Just as in similar games like Farmville and Harvest Moon, the player takes the role of a farmer who establishes their own farm and performs everyday tasks such as watering plants, growing food, and tending to animals. Pelican Town, referenced in the title text, is a fictional village in this game.

In this comic, Cueball begins his morning routine in a Stardew Valley session by waking up and watering some of his farm's plants. However, he then walks up to a sleeping cat, pauses for a moment, then pours water on it, startling it awake. He says "Dammit." to this, likely indicating this isn't the first time he's made this mistake.

In the game, watering plants is an essential chore, which requires the player to "equip" a watering can. The player moves their character up to a plant and simply presses an action button (or key) to perform the watering action. The same action button is used to interact in different ways with other things, animals and people (e.g. to talk to them), so accidentally leaving the watering can equipped while trying to talk to someone can cause the player to "water" them instead. The comic illustrates how easy it is to do this in the game, as well as the comedic value of seeing this happen from the point of view of the player's character. Also, by doing this, you waste energy, which is a limitation on how much you can get done in one

in-game day, making Cueball frustrated by wasting energy on watering his cat.

The title text reinforces this humor by indicating that Randall has used the watering can, probably unintentionally, on nearly every person and object in the game. It's amusing to think that he may curse each time he realizes he's still holding the can when he tries to talk to someone. (His use of the word "Dammit" in this comic also calls to mind a brief discussion on the word in 559: No Pun Intended.)

The use of the word "virtually" in the title text plays with the word's double meaning. It is used here in the sense of "almost", however when swapping the words "virtually" and "waters", the word assumes its alternate meaning, but the title text still makes sense: Since the game is only a simulation, the player "virtually waters" his plants.

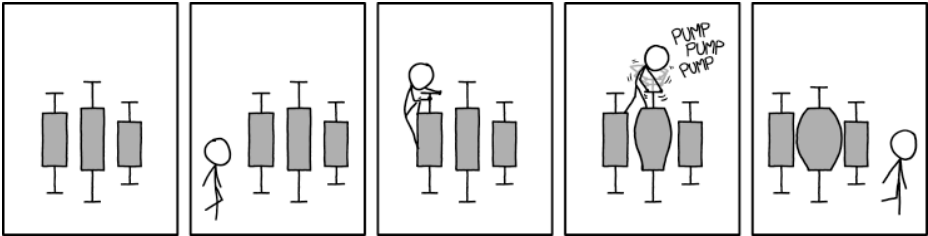
Stardew Valley was also mentioned only two weeks prior to this comic in 1790: Sad; this comic explains why.

Interestingly, this comic is drawn in a slightly unusual style for xkcd. Of note is the border around the caption ("Stardew Valley Morning Routine"), the thicker-than-normal penmanship, and the use of drawn borders around the watering sound effects, Cueball's yawn, and the cat's sleeping word balloon. The cat's balloon in particular follows the visual style of the game (in which certain objects and animals may show their current emotional states with word balloons) - more generally, actions that normally occur in the game, such

as the yawn and the watering action, appear to be shown in balloons while Cueball's "Dammit!" is written in the style of other xkcd comics. This likely suggests that Cueball's epithet here represents the player (Randall) actually saying this in response to the incorrect action of his character in the game.

#1798: Box Plot

February 13, 2017



You have to be careful doing this. Sometimes, when you push the whisker down, dynamite explodes.

Explanation

This comic shows three vertical box plots in the first panel, hence the title.

In descriptive statistics, a box plot is a convenient way of graphically depicting groups of numerical data through their quartiles. The second quartile is the median and it is not indicated in this comic, as it should be a line through the box (see the definitions of quartiles). But the top and bottom of the box is the first and third quartile, which splits the lowest/highest 25% off data of from the highest/lowest 75%, respectively.

Box plots may also have lines extending vertically from the boxes (whiskers) indicating variability outside the upper and lower quartiles, (that is, the highest and lowest values in the data,) hence the terms box-and-whisker plot. These can be used to indicate the interquartile range, a measure of statistical dispersion. These have been included on the three boxes in the plot.

The joke in the comic arises, because it turns out that the box plot is actually three real world objects and Cueball walks into the plot in the second panel, climbs up on the lower first box and on to the highest middle box. When the boxes are depicted in the orientation shown, the boxes can look like they are pumps, where the middle part, the box, can be pumped up. And Cueball does just that in the fourth panel, by pushing the top whisker down and when he leaves in the fifth and last panel, this

box stays inflated, with the whisker visibly lower than in the first three panels, although higher than when he pushed it down in the fourth panel. (Inflating things that cannot be inflated was also the joke in 1395: Power Cord. But as opposed to inflating the meaning of data, which many researchers sadly do in the real world, what Beret Guy does in that comic, is strictly supernatural.)

It could be said that the "data" in this comic was "inflated" and thus Cueball has been trying to show a smaller interquartile range than there actually is, thus inflating the possible conclusions that could be drawn from the data.

The title text refers to how dynamite, an explosive, often used to have detonator boxes (aka. blasting machines) which also looked similar to the top part of the box (without the lower whisker). These detonators were most commonly used for mining, with long wires leading to the explosives. Modern blasting machines are operated by push buttons and key switches, but the old push-handle design still resonates in the public consciousness today, due to its exposure in classic slapstick cartoon shorts like Looney Tunes, especially often used by Wile E. Coyote against the Road Runner. See this compilation for examples.

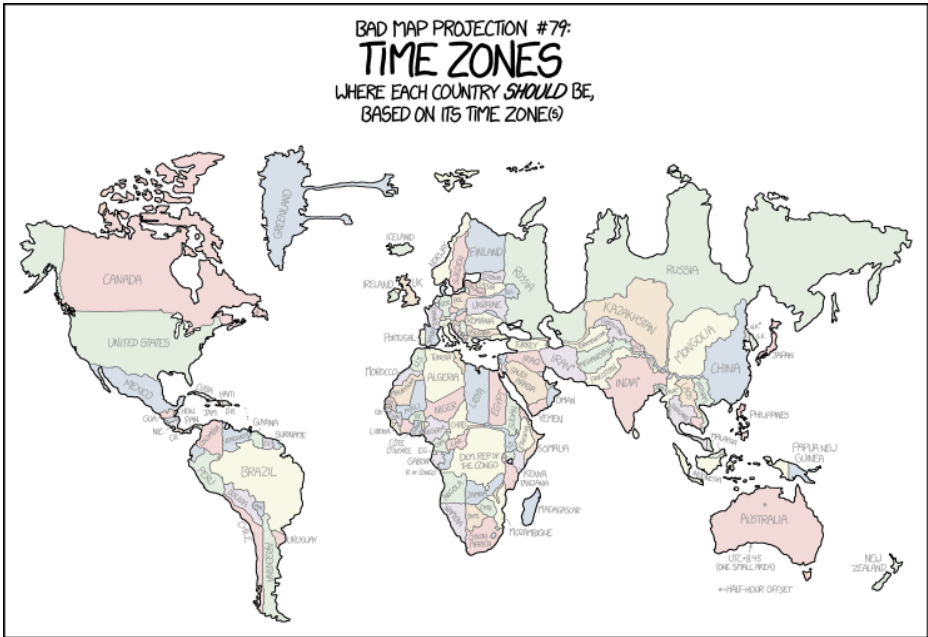
The title text also refers to so-called dynamite plots. This type of plot used to be very common in scientific publications, but since it hides most details about one's actual data, it is now frowned upon. The recommended alternative is the box plot.

The title text thus warns against this kind of data inflation, since sometimes it can go awry and lead to explosions. Randall has often made comics about presenting data as more important than they are, in one way or another, and this comic clearly falls into that category. See for example 882: Significant, 1132: Frequentists vs. Bayesians, 1478: P-Values and 1574: Trouble for Science, and this one for manipulating the way data is presented: 558: 1000 Times.

A box plot was also used in 539: Boyfriend, maybe the only other time in xkcd. There are many other types of data carts that have their own subcategories, but not this type.

#1799: Bad Map Projection: Time Zones

February 15, 2017



This is probably the first projection in cartographic history that can be criticized for its disproportionate focus on Finland, Mongolia, and the Democratic Republic of the Congo.

Explanation

This is the second comic in the series of Bad Map Projections and presents Bad map projection #79: Time Zones. It was first with this comic that it became a series. The series began a month earlier with 1784: Bad Map Projection: Liquid Resize (#107). It was followed almost three years later with 2256: Bad Map Projection: South America (#358).

This comic shows a map projection in which countries are placed according to the time zones that they fall under. It seems that Randall, being Randall, runs with the idea as he has made yet another map projection that is not only inaccurate, but utterly unusable, though less so than the previous one.

The first "Liquid Resize" was #107, while this comic features #79. Since the liquid resize was purely aesthetic, whereas this one at least conveys some meaningful information it makes sense that this projection is ranked higher.

Conceptually, the series is a comment on the fact that there is no perfect way to draw a map of the world on a flat piece of paper. Each one will introduce a different type of distortion, and the best projection for a given situation is sometimes very disputed. Randall previously explored 12 different projections in 977: Map Projections, and expressed his disdain for some types he sees as less efficient but whose users feel superior. None

of them are really good as any 2D map projection will always distort in a way the spherical reality, and a map projection that is useful for one aspect (like navigation, geographical shapes and masses visualization, etc.) will not be so for all the others. Local maps of smaller areas can be quite accurate, but the idea of both these map projection comics is to map the entire globe on a flat surface.

Time zones are based on the way the Sun shines on the Earth, so these time zones, which are based on the sun's position in the sky, would best be divided by roughly longitudinal (North-to-South Pole) lines. However, this is not the case in practice, as the defined time zones tend to have very jagged boundaries, and furthermore some countries use a completely different time than the zones they are in, at least for some parts (see China). Since Randall knows he cannot fix the boundaries of the time zones, he instead "fixes" the world by making a map appear to match up with the time zone system, as shown in this map, also posted in the trivia. This results in bizarre distortions such as the large, gum-like strands of Greenland (these are the towns of Danmarkshavn (UTC) and Ittoqqortoormiit (UTC-1), which use different time zones to the rest of the island) and three enormous gulfs in Russia (some time zones in Russia are only used in southern areas, leaving two-hour differences between some adjacent areas on the country's northern border). See also this map with a time zone map overlaid the comic.

The effect of this map is to "punish" large countries with

a single time zone - for instance, China, which uses UTC+8 across the whole country - and countries that share large time zones - for instance, almost all of Europe is packed into the Central European UTC+1 zone - by shrinking these down. Conversely, countries that use multiple time zones without filling them out are stretched out - for example, the Democratic Republic of the Congo (DRC) and Mongolia, as pointed out in the title text - as are slim countries that do not fill out the full width of their time zones but where their neighbors use different timezones so they have to fill the entire width of their time zone. For instance Finland (also mentioned in the title text) and the Baltic countries, who look huge because their western and eastern neighbors do not use the UTC+2 Eastern Europe time, and thus have to fill out the distance between the countries that are pushed to the zones on their east/west borders.

Other map projections distort countries this way as well, but based on their actual physical location as opposed to their position on imaginary time zones. The Mercator projection is infamous for distorting Greenland in this way, to the point that it appears to be larger than Africa despite being nowhere near the same size.

See the table below for lots more information on the comic, but here are some further details.

Map imperfections[edit]

The map is imperfect for several reasons:

Randall attempts to preserve adjacency where possible - for

instance, Chad and Sudan are neighbors even though Chad uses West Africa Time (UTC+1) and Sudan uses East Africa Time (UTC+3). Randall draws an extremely thin strand connecting the countries through Central/South Africa Time (UTC+2), even though no part of Chad or Sudan uses this time. Similarly, a thin strand of Kazakhstan and Turkmenistan is shown projecting into the UTC+4 time zone in order to separate Russia and Iran, which do not really share a border. Worst of all is China, which has to have borders to several countries that do not share the single eastern time zone of east China, which the whole China is forced to use. A thin strand, resembling the Yangtze river, is shown passing through time zones that China does not use. This is the most complicated preservation of adjacency shown in the map.

There is no mention of daylight saving time - all countries shown are given the base winter time. Depending on the time of year, countries will shift around - around June, many northern hemisphere countries will move east, while some southern hemisphere countries will move east around December.

The map doesn't allow for half-hour time zones. (India, for instance, is on UTC+5.5) Instead, countries that use fractional time zones are shifted so they straddle the two time zones, and are then marked with an asterisk (*). This is also true of regions within countries, including the island of Newfoundland in Canada and a section in the center of Australia.

The only extra detail mentioned in the map is also for Australia. It is the UTC+8:45 time zone that is used only by 5 roadhouses covering a population of only a few hundred people.

There are several errors in the map, see below.

Table of countries and their time zones[edit]

This sortable table includes all countries shown in the map, not just those are labeled, as well as the continents and some other regions are mentioned.

The countries or continents are mentioned approximately in reading order. If a country is not labeled with full name the abbreviation is in brackets behind the name. If the country is not labeled, labeled wrong or not even shown in the comic, there is a note after the name. Countries labeled with a footnote by an asterisk (*) are shown together with that asterisk at the name.

If a country has more than one time zone all are listed.

#1800: Chess Notation

February 17, 2017



$\frac{1}{2} - \frac{1}{2}$

I've decided to score all my conversations using chess win-loss notation. (??)

Explanation

Cueball begins a conversation with White Hat with the declaration that he will be scoring his conversations using chess notation (hence the title). White Hat is not interested, so the conversation dies out, with both Cueball and White Hat saying "Fine". For Cueball, that might be due to it having become a personally satisfying conclusion to the short conversation, whereas White Hat may instead be stating that (from a low bar) there's no possible way the conversation could get any better; but both would be content with their apparent 'agreement'.

And just as promised, Cueball has scored this particular conversation, giving it a $\frac{1}{2}$ - $\frac{1}{2}$, as he believes that this is a drawn conversation. The reasons for the draw may be due to agreement (both parties walk away afterwards), a stalemate (the conversation isn't going anywhere), draw by repetition (both players have played the same moves over and over again, and cannot improve their position - probably if "Fine" had been repeated more times), 50-move rule (the conversation has been going on fruitlessly for too long - unlikely here since it is only 4 dialogues long), insufficient material (they've no more material to continue the conversation) or something else. There could be some similarities between chess games and conversations. In general, see more under the trivia section.

The title text contains the same assertion that Cueball is scoring all his conversations in chess notation, followed

by a (??). In chess notation, (??) means the move in question was a very bad, or losing, move - a blunder. Cueball scores this part of the conversation as a blunder, which is understandable as it immediately turned the conversation against him. It can also be considered a losing move not just in the conversation but in general, being a confusing and pointless decision with no apparent gain. If Cueball is treating his conversation itself like a chess game (memorizing openings, using tactics, and evaluating various possible things to say), then he will avoid ever opening a conversation with this statement again. If he was scoring his idea to score his conversations as a blunder, then that itself may yet be another blunder. Either way, quite a ?? indeed!!

The (??) may also be interpreted not as chess notation, but as regular interpunction, in which case it would denote a confused reaction by someone who doesn't know what chess notation is (like White Hat in the comic). This makes it a double entendre, covering both the case when either the conversation party or the reader doesn't understand what chess notation is (and thus reacts with confusion to Cueball's announcement), and the case when chess notation is understood, and actually used to comment on the soundness of Cueball's move as being a blunder.

#1801: Decision Paralysis

February 20, 2017



PROTIP: IF YOU EVER NEED TO DEFEAT ME,
JUST GIVE ME TWO VERY SIMILAR OPTIONS
AND UNLIMITED INTERNET ACCESS.

Good point--making no decision is itself a decision. So that's a **THIRD** option I have to research!

Explanation

This comic illustrates a common problem in the internet era where, with the wealth of knowledge available to us at all times, one puts undue weight on otherwise arbitrary decisions.

This is taken to a comedic extreme by showing how Cueball is unable to make a critical, time-sensitive choice without putting hours of research in to justify it. Any benefit to researching the imminent decision of "which car will get us to our destination fastest" will be more than offset by the time it takes to make that decision.[citation needed] The inability to make a snap judgment in this case will prove very destructive as the bomb mentioned by Megan will now likely detonate before they get to the base. The difference in time/effort needed to steal either car is likely presumed to be insignificant to this scenario.

In the caption below the comic Randall gives the reader one of his recurring protips. In the tip, he reveals a weakness for his potential opponents to exploit. Randall admits to having the same problems with decision-making as Cueball, and suggests that if he were placed in an equally urgent situation testing his (in)ability to choose, he would fail just as spectacularly, as long as he had free access to the internet. As the old saying goes, "give 'em enough rope, and they'll hang themselves"; in this case, give Randall enough internet access, and he'll get caught in an indefinite research loop.

The title text continues this absurdity by bringing a third option to the table, the choice of inaction (which by wasting his time on calculations and research, Cueball has taken), a choice here that seems unacceptable, but the time spent mentioning (and researching it) simply adds to that already spent researching the two cars. Of course this option ensures that they are not killed when the bomb explodes, because they will not be anywhere close to the base. That might make it the only reasonable choice left after wasting so much time pondering which car to steal.

That not making a choice is also a choice has often been mentioned in literature and other places, like when the band Rush in their song Freewill sings "If you choose not to decide - You still have made a choice".

Supposing both of them know how to drive (and steal) a car and defuse the bomb, the best option in this situation is to leave the phone in the pocket and steal both cars, and see who gets there first to defuse the bomb. This would both ensure one of them reaches the base as quick as possible and at the same time resolve the problem of which car would be best for the problem. Of course that would also have defused the joke, No Pun Intended...

#1802: Phone

February 22, 2017



[*disables social networking accounts*][*social isolation increases*] Wait, why does this **ALSO** feel bad?

Explanation

When someone asks you if you want to go for a walk they often expect to have a conversation, while enjoying both the exercise, the fresh air and the company. Thus any disturbance not related to the walk is not welcome. Going for a walk is often seen as a way to relax from all the daily stress, as it takes the walkers away from work and chores.

Cueball agrees to go for a walk, but not to all the associated expectations. His first instinct is to bring along his smartphone, though rather than call it such, he opts for a lengthy description detailing all the functions he intends to use. He describes the phone as a device that gives him a continuous (24/7) stream of information, much of which is often out of context. The stream contains people's opinions, context-free but scary news, and other random stimuli. Conspicuously, long-distance communication (ostensibly the primary function of a smartphone) is not listed. This may be a sign that Cueball is addicted to his phone.

The stream of opinions mentioned could be from news or bloggers but it could also just be from his friends on social media platforms. News stories that are shared on social media are often scary, which becomes even worse because news outlets are likely to use a title that exaggerates the topic to create a fear reaction. The random emotional stimuli could be from many things such as text messages/emails and pictures of kittens and

babies on social network, and shared internet memes or viral videos. All things that could cause a quick shift in emotions.

As if all this was not enough, Cueball even says he will also take his spare battery, so he won't risk that his constant feed could be interrupted, because he will not be able to recharge his phone during the walk. All in all, his choice and constant need for staying updated and being online violates all the usual expectations, that his friend could have expected from asking him out for a walk. Randall's fear of running out of power on his smartphone was earlier mentioned in 1373: Screenshot, where a low battery charge stresses him too much to realize it is someone else's screenshot, rather than his own phone that has a low charge. Since then he has made other references to his issue with low batteries in 1872: Backup Batteries and 1965: Background Apps.

The title text shows it would be possible to take an action to avoid this feed. In the first bracket a person (could be Cueball or Randall) disables all his social networking accounts. Most of his news feed will thus disappear. But this leads to the next bracket which states that such a choice would lead to increased social isolation, since he will no longer be in contact with any of his online friends. In fact, today many people also get into contact with their "real" local friends through social media, so one might thus miss out on events like parties or get-togethers. In addition, his friends, not sharing his dislike for social media, may not understand his decision. All of this leads to the final sentence Wait, why does this

ALSO feel bad?

#1803: Location Reviews

February 24, 2017



I LOVE FINDING REVIEWS OF PLACES THAT
REALLY DON'T NEED TO HAVE REVIEWS.

Google and Yelp keep deleting my scathing reviews of the Mariana Trench, the Chernobyl reactor core, the jet stream, and the equator.

Explanation

Many online advertising services and social media networks (such as Google and Yelp (both mentioned in the title text) and Facebook) allow users to leave reviews of stores, businesses, and locations. For various reasons these sites often find themselves with pages dedicated to, as Randall puts it, "places that really don't need reviews" such as municipal works installations, government property, and natural landmarks. This naturally attracts both clueless people and lots of self-styled comedians leaving less-than-helpful comments on such review pages.

Randall is poking fun at this phenomenon by inventing possible reviews for the (fictional) location Canyon River Nuclear Launch Facility, depicted with a Google Maps-styled map page along with a series of so-called reviews. (There does exist a Canyon River located in Ontario/Canada and one in Washington/USA (the latter is a significant tributary to the Satsop River). Canada does not maintain nuclear weapons since 1984, so such a launch site would be located in Washington).

See explanations for the 11 visible (out of 22) reviews in the table below. Of course those responsible for such a facility with nuclear missiles would not like the attention they would be getting in this way, especially not when one of the comments mentions a hole in the fence... Although this comic makes a joke about reviews it has chosen a very dangerous facility to joke about.

In the title text Randall mentions that both Google and Yelp keep deleting his scathing reviews of several locations like the above. The question is if they would have done it if they had not been so harsh... While Canyon River Nuclear Launch Facility appears not to exist, the places/phenomena he lists in the title text certainly do, and are places that you either cannot or would not normally visit as destinations. Here below each "location" is explained. That the deletion of such reviews is real has been proven by this comic, as it also happened for those that (of course) posted these reviews on Google maps as a response to this comic.

Mariana Trench is the deepest area of the world's oceans, about 10,994 meters (36,070 ft) deep, located between Japan and Australia. The pressure in the Mariana Trench is about 1,086 bars, more than 1,000 times the standard atmospheric pressure of about 1 bar at sea level. Despite this enormous pressure some organisms live in the Mariana Trench. Humans can reach the ground only by special deep-sea submarines, like Jacques Piccard did in 1960 with the Bathyscaphe Trieste. See reviews for the Mariana Trench at Google Maps and Facebook.

The Chernobyl reactor core is the most dangerous part of the Chernobyl Nuclear Power Plant. It is located in the North of Ukraine. In the reactor No. 4 there was a nuclear disaster that happened on 26 April 1986. It caused devastating damage and massive radioactive contamination. There is still a Chernobyl Exclusion Zone 30 kilometers around the power plant. See reviews for the Chernobyl power plant at Google Maps and

Facebook.

Jet streams are a meteorologic phenomenon about 9 to 16 kilometers above the ground. A stream consists of air currents with speeds from 92 km/h (50 kn; 57 mph) to over 398 km/h (215 kn; 247 mph). Such jet streams are routinely used for reducing fuel usage for long distance plane travels. As it is a ribbon rather than a point, it could not have a single point on the map. Also, the jet stream fluctuates north and south; so even if it could be pinpointed, the location would be constantly changing.

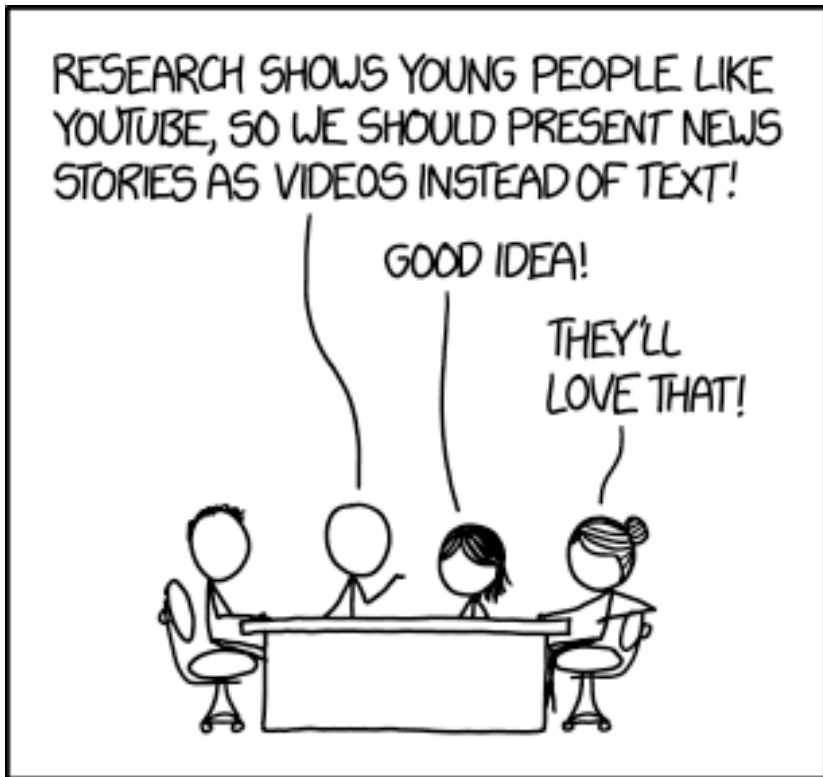
The equator is, as with the jet streams, not a singular place but a circumference around the Earth. Reviewing the equator as a singular location is rather pointless (no pun intended), though there is a whole range of specific (and interesting) locations around the equator, with countries with tropical rainforest climate, which many people from European and North American countries struggle with. That said, most of the equator goes over water.

Reviews[edit]

In the table the rating is given with the review. After that an explanation both of the rating and of the review is given. Notice that any or all of the reviews could be sarcastic or "trolling", as is fairly typical on the internet, especially for reviews given for such a location as this one. This table assumes all the reviews are played straight.

#1804: Video Content

February 27, 2017



INSTEAD OF ARGUING WITH NEWSPAPERS ABOUT THIS, WE SHOULD JUST TELL THEM HOW MUCH YOUNG PEOPLE LIKE MAKING OUT AND SEE WHAT HAPPENS.

"So, like, sexy news videos?" "No, people have tried that--it's still just video content. We need to actually inform people **THROUGH** making out. I would call it 'Mouth Content,' but I think that's already the title of a Neil

Cicierega album."

Explanation

This comic is a commentary on the growing media industry and their successful/unsuccessful attempts at regaining an audience.

In 2015, news media began an industry-wide transition away from text and towards video content, in what became known as the "pivot to video." News media has evolved dramatically as the world entered the information era. Newspapers, which were at one point the most widely distributed and consumed form of media, had rapidly been eclipsed by new technologies such as television, Internet, and streaming video, and subscriptions to paper-based media were drastically declining to the point where many publishers were on the verge of shutting down. Thus, many media sites started moving their content to video, as based on statistics that it was more popular, especially among younger consumers. However, the logic behind it was specious, as this comic shows. In 2016, it was revealed that the "pivot to video" was largely driven by inaccurate numbers touted by Facebook; while many sites continued trying to attract younger viewers with video content, the "pivot to video" became largely seen as a failed strategy.

The comic illustrates one such example with Cueball suggesting presenting news stories as videos rather than text. This is presented and received by Megan, Hairbun and Hairy as a clever new idea that would appeal to

young people based on the fact that they like watching YouTube videos. However, apparently no one in the comic has realized that television news programs have been filling such a niche for decades and that young people are just as uninterested. In fact, online video based news is often considered annoying, especially if autoplaying or if there is no text based alternative. In reality, this idea is not at all original and likely to be doomed to fail from the start. As with many similar attempts, the new "ideas" that publishers are trying to adopt are merely cramming news content into things young people like, without really understanding why they like it and without considering whether news would be a good fit.

In the caption, Randall suggests it would be pointless to argue with newspaper publishers about their ideas. Presumably Randall believes publishers who fall for those ideas are already out of touch with the new generation, and would not be able to understand why those ideas lack merit. Instead, he suggests taking the trend to a ridiculous extreme, by telling publishers that young people like making out. Suppose publishers follow the same pattern and try to cram news into this as well, they would end up creating some form of news program centered around making out. The results may turn out completely laughable or highly entertaining. If the former, it could serve as a wake-up call to publishers that they need to reconsider their approach. If the latter, then it could actually become a trend and unexpectedly reinvigorate the industry.

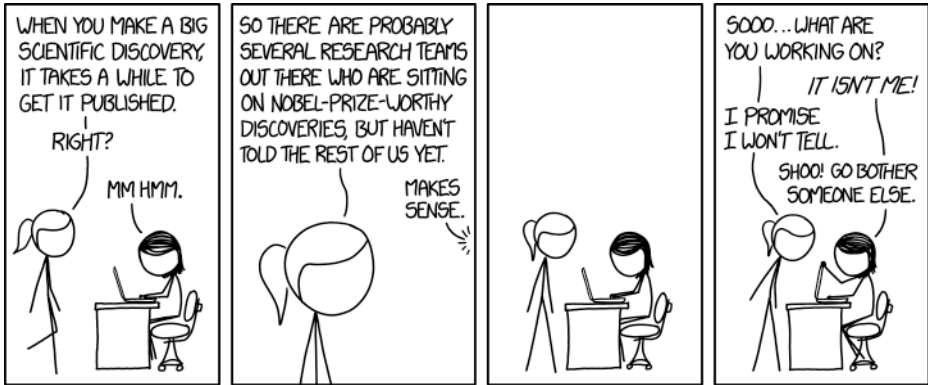
In the title text it seems like the news agency actually consider this idea, or is at least confused enough to ask. Their interpretation of combining "making out" with news is to make it sexy, but the next speaker says that this has been tried before and doesn't work. This is likely a reference to Naked News, a news program that does that: it features attractive women delivering the news while simultaneously disrobing. This concept has not, for obvious reasons, gone mainstream.

According to the speaker, merely making the news sexy is not enough – the news content must be directly integrated into the making out; how this would be accomplished is as yet unclear.

The title text also dismisses the proposed name Mouth Content as possibly the title of a Neil Cicierega album, in reference to his recently-released Mouth Moods, as well as his prior albums Mouth Sounds and Mouth Silence.

#1805: Unpublished Discoveries

March 01, 2017



If you must know, I'm currently researching how to save this emailed tax form as a regular **PDF** so I can print and sign it. Our work isn't a lock for the Nobel, but we're in the running.

Explanation

Ponytail walks up to Megan, and makes the observation that when a scientific discovery is made, it then takes a while to publish it. She then goes on to note that there are probably research teams making "Nobel-Prize-worthy" discoveries that have simply not been published. She is obviously curious if Megan is working on something like this, and tries to see what Megan is working on, but Megan prevents her from seeing this by partly closing her laptop. Then Ponytail asks Megan what she is doing but Megan just tells her that she isn't the one working on a project like this and ask her to "Go bother someone else."

This is not the first time Ponytail asks Megan if she is working on some groundbreaking research project: Back in 1067: Pressures, Ponytail was probing Megan about her work, since, as hinted by the caption of that comic, Megan is a Swiss patent clerk just like Albert Einstein. Ponytail thus assumes she has the same potential to produce Nobel-Prize-worthy work as him. While there is no clear indication that this comic should be a continuation of that comic or that Megan is a patent clerk, Ponytail still assumes Megan is on her way to a Nobel Prize - but that Megan is just not yet ready to announce her discovery to the public for one reason or another.

In the first two panels, Ponytail is referring to the general issue that, to publish a discovery on a scientific topic, it

can take a very long time, especially when the discovery is "Nobel-Prize-worthy". Obviously the first step is for the researcher to demonstrate rigor by more supporting experiments (see 397: Unscientific), plus summarize the discovery into the format accepted by the journal the paper is submitted too. The latter can take considerable time by itself, especially if the first journal the paper is submitted to declines publication. Because other journals chosen afterwards may have a completely different layout (for instance in physics, the journal with the greatest impact factor is Nature, then followed by for instance Science and then Physical Review Letters. All three have very different layouts regarding format and figures etc.) Thus the paper may need to be submitted to various journals until one accepts, which may also take a few months, and even when accepted it can take anywhere from 25 days to 150+ days just for the paper to be processed through the publishing system due to various reasons, including the nature of the publishing process, assigning extra work as conditions for acceptance, or even formatting problems. This has prompted researchers to come up with some interesting work-arounds.

In the title text, Megan claims that she is actually just trying to convert an emailed tax form to a PDF. This could of course just be to ward off any further attempts by Ponytail to spy on her "real" Nobel-worthy work. Megan sarcastically states that her conversion of tax forms is in the running for a Nobel Prize, perhaps because she considers it an incredibly difficult task (even

for these things that should not be hard - see 1349: Shouldn't Be Hard). While this could be true, this task is in no way connected to any kind of scientific endeavor, and as a result could never be considered for any kind of Nobel Prize. That the task is so difficult is though officially acknowledged by the IRS as they themselves note that saving and printing their Online tax forms could be tricky. Quote:

The months and weeks before April 15th (this comic was released on March 1st), is the "tax season" in the US so Americans are in the process of completing their tax forms, which is why this comic is timely. Given the US tax code is complained by many to be too complex, it is possible for researchers to delay publication of their discoveries to deal with their tax returns first. This can cause people to "sit on their discovery" for a while, although hopefully not as long as the task of publishing itself.

A year after this comic, 1971: Personal Data became the second tax related comic to be released in March, close to the tax day, making it two years in a row. Also before these comics the trouble with tax returns was the joke in 1566: Board Game, but it was released in August.

#1806: Borrow Your Laptop

March 03, 2017



ONCE I'VE USED A COMPUTER FOR A WHILE,
NO ONE ELSE WILL EVER USE IT AGAIN.

If used with software that could keep up, a scroll wheel mapped to send a stream of 'undo' and 'redo' events could be kind of cool.

Explanation

White Hat asks to borrow Cueball's laptop to view something (possibly a website). Cueball permits this, but immediately begins rattling off a list of very unusual key- and mouse-bindings that he has applied to the device. In the caption, Randall states that he himself tends to continually re-configure computers that he owns in weird ways, eventually rendering it unusable or at least unpleasant to use for others.

Of the three items in Cueball's list of customizations only the first and half of the second seems like a real and relevant changes.

At first he has programmed the computer so that hitting both shift keys simultaneously will change the keyboard back to QWERTY. The QWERTY keyboard is the standard in the US (as well as some other places using the roman alphabet). This implies that Cueball prefers a different keyboard layout, (most likely the Dvorak keyboard layout, see trivia), but doesn't need the printed letters to match up with those of the laptop. Cueball would have to make a special customization to make pressing the two shift key trigger this shift (see trivia). Presumably Cueball can later return to this favorite layout by pressing the shift keys again.

Cueball tells, in the first part of the second point on the list, that he has changed his keyboard layout so that capslock acts as the control key (Ctrl). Swapping

capslock and control is a common thing to do in the world of enlightened users on Unix or for users of the Emacs editor. The "Caps Lock" key (immediately to the left of the "A" in a traditional layout) is much easier to reach for a touch typist than the more out-of-the-way "Ctrl", and the latter is often used more frequently, especially by programmers.

However, the second part where Cueball says he has then moved capslock so that it is activated when hitting the spacebar makes no sense. It is quite impractical, as the spacebar is the largest key and it will not gain anything from being used for anything other than spaces, especially not a rarely used key that locks into capital letter mode move when activated. It would make the common accidental application of capslock more likely. And what is worse he doesn't tell White Hat where he has put the space bar function, making it impossible to write a simple text, although he could try to see what the Ctrl keys does now...

Finally Cueball goes out on a limb with an impossible setting, which is that his laptop is setup so that scrolling moves through time instead of through "space" (as in up and down on the screen). This refers to spacetime, a common model in relativistic physics. The feature is only activated when using two-finger scroll, which is often used on touchpads/track pads for laptops as a gesture for scrolling. The title text may suggest that "moving through time" may pertain to undo/redo, or perhaps browser history.

Finally it becomes clear these three settings are not the only important changes, as Cueball's list continues with at least one other point which he doesn't get to finish in the comic. Thus the list may be much longer than four points.

In the title text Randall says that he would actually find a feature where the scroll wheel was mapped to send a stream of undo/redo commands would be kind of cool. (Notice he is no longer talking about the two-finger scroll from the comic). But only if used with software that could keep up with such a feature. He thus indirectly states that many programs would not be able to keep up. For an example of what this might look like, many digital artists record timelapse footage of their art, which could be thought of as a continuous string of redo commands (occasionally broken up by undo commands whenever the artist needs to correct a mistake).

Outside of art programs, such continuous undo/redo action would produce unexpected and chaotic results. This could also indicate that this was a similar feature that Cueball was referring to when talking about moving through time with the two finger scroll in the main comic. So not as in the computer traveling through time, but rather scrolling through the previous actions performed on the computer, as in moving through the computer's past.

People often have reasons to change their keyboard layouts on laptops, due to the reduced keyboard, which can leave vital keys out. Rather than change the keyboard

layout all the time in order to access keys which are not accessible in one of the layouts, one can take advantage of text substitution and keyboard remapping programs to set shortcuts for keys they use often.

#1807: Listening

March 06, 2017



WHEN VISITING A NEW HOUSE, IT'S
GOOD TO CHECK WHETHER THEY HAVE
AN ALWAYS-ON DEVICE TRANSMITTING
YOUR CONVERSATIONS SOMEWHERE.

Sure, you could just ask, but this also takes care of the
host gift thing.

Explanation

This comic depicts Cueball and Ponytail welcoming Black Hat and Danish to their house. Black Hat immediately talks to Amazon Alexa to order two tons of creamed corn. This would be quite expensive (around \$10,000), and the hosts would be charged because it was ordered on their Amazon Echo device. It would also be a serious inconvenience. The purchase would be quite bulky and useless, not even likely to arrive until after the visitor has departed, with an average homeowner having very little use for two tons of creamed corn.[citation needed]

The caption claims that this is an effort to find systems recording conversations, such as Alexa or Google Home, for the security of the guests, so they aren't being monitored by an always-on listening device without their consent (at least not without any consequences). However, because Black Hat is the one coming up with this, it's more likely his motives are on the sadistic side, and it's more likely a warning for the hosts to turn off any voice-activated systems before having guests come over so that the guests don't take advantage of them. (It should also be noted that such purchasing services encourage the user to set up a PIN code to fend off such exploits.)

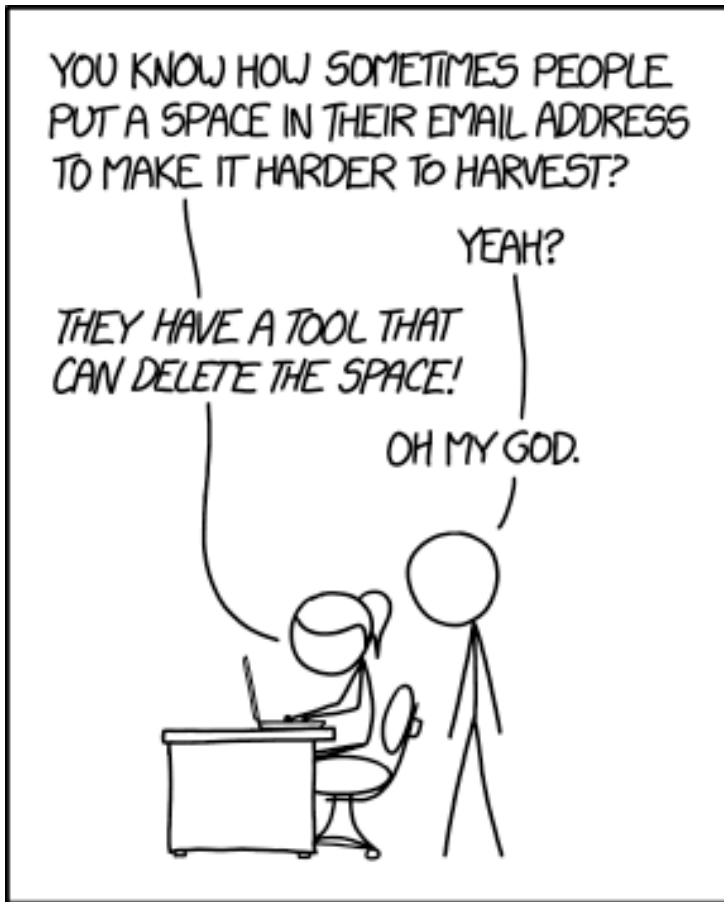
A concerned "visitor" may also want to test for voice-activated systems when near any persons carrying an iPhone or Android mobile device, because these are

also always-on listening devices. "Hey Siri" and "Ok Google" voice activation use the same technology as "Alexa" and "Echo" detection.

The title text says that this takes care of the "host gift thing", referring to the custom where house guests give a gift to the hosts. However, Black Hat is making the hosts pay for it, so it can be as expensive as he wants, thus making this yet another example of his being a classhole. For more examples of this, see the trivia below.

#1808: Hacking

March 08, 2017



LESS-DRAMATIC REVELATIONS FROM THE CIA HACKING DUMP

The dump also contains a list of millions of prime factors, a 0-day Tamagotchi exploit, and a technique for getting gcc and bash to execute arbitrary code.

Explanation

This comic is referencing an incident on the day before this comic was released, March 7, 2017, in which WikiLeaks exposed thousands of hacking exploits (thus the title) and programs from the CIA (see for instance this article: [WikiLeaks Just Dumped a Mega-Trove of CIA Hacking Secrets](#)). Many of the tools that were in the leak were similar to publicly available tools, or not entirely unexpected, with several coming from sites such as StackOverflow and Reddit.

The main joke in this comic refers to the common practice of adding spaces between parts of an email address when publishing them on websites. For example, "" may be written as "john dot doe at example dot org". The purported goal of doing this is to thwart page scraping bots from harvesting the correct email addresses and prevent them from becoming the target of spam or being sold as address lists for email marketers.

In this comic, Ponytail tells Cueball that the CIA has a tool which can delete such spaces. Such a tool can fix the space and most likely convert the words "dot" and "at" into their respective symbols. This will overcome the problems faced by harvesting tools, and make these email addresses more prone to receive spam.

Cueball appears shocked to hear this news, but given the caption below, stating that this was one of the less

dramatic revelations from the CIA hacking dump, this is likely sarcasm by Cueball (and Randall). In fact, it is quite simple to devise a program which detects and converts/removes such spaces; it's naive to believe that one can prevent e-mail addresses from being harvested just by writing the addresses with space or omitting @ etc. Some people might not realize that he's being sarcastic, though, and that misunderstanding might be part of the joke.

The title text lists three other undramatic (fictitious) hacking exploits which sound more interesting, but are still more or less useless, and certainly not dramatic news. They are:

#1809: xkcd Phone 5

March 10, 2017



The phone will be collected by the toll operators and mailed back to you within 4-6 weeks.

Explanation

This is the fifth entry in the ongoing xkcd Phone series, and once again, the comic plays with many standard tech buzzwords, and horribly misuses all of them, to create a phone that sounds impressive but self-evidently isn't to even the most ignorant customer. The previous comic in the series 1707: xkcd Phone 4 was released almost 8 months before this one and the next 1889: xkcd Phone 6 was released 7 months later.

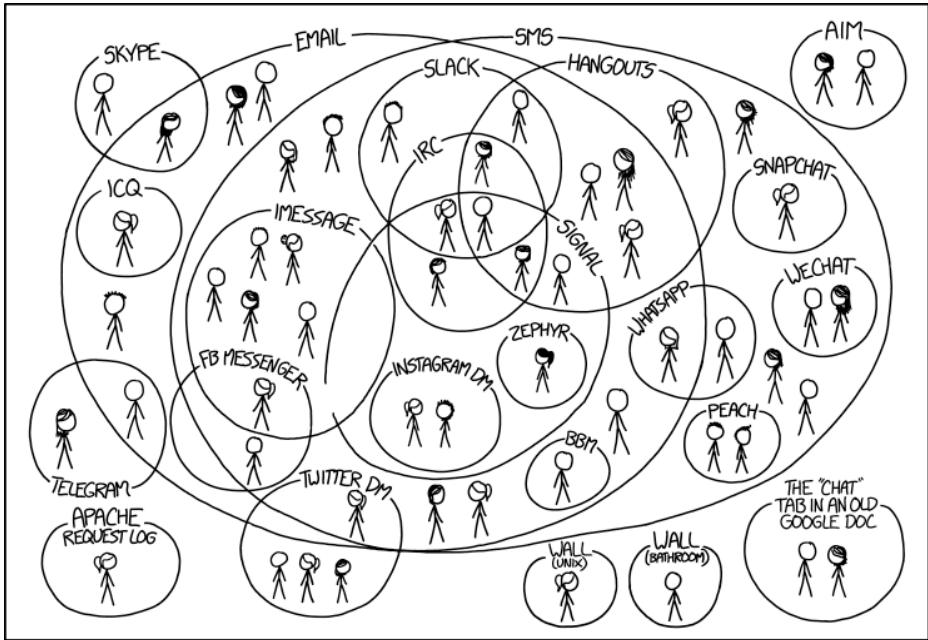
The tagline beneath the phone, "We're trying to catch up to Apple but refuse to skip numbers", is a reference to inconsistent product numbering, such as Samsung releasing the Note 7 after the Note 5, likely in an attempt to catch up to the numbering of either the iPhone or Galaxy S series, both of which were already at 7. Similarly, there was also no official iPhone 2. But there is an xkcd Phone 2 available.

This phone seems to have a curved display. But the edges are curved down and not up, as they are on other curved phones. From the top, going clockwise:

The title text that says that the phone will be returned to you by the toll operators is a reference to E-ZPass partnership feature; see explanation in the table regarding that feature.

#1810: Chat Systems

March 13, 2017



I HAVE A HARD TIME KEEPING TRACK OF WHICH CONTACTS USE WHICH CHAT SYSTEMS.

I'm one of the few Instagram users who connects solely through the Unix 'talk' gateway.

Explanation

The comic consists of an Euler diagram showing a wide variety of chat systems and their intersections. (Euler diagrams should not be confused with Venn diagrams, see more on this [here](#)). The comic demonstrates the complexity that can be involved in modern communications: simply remembering how to get in touch with someone can be a challenge.

Below is a table with explanation for all 24 mentioned chat systems and below that a list of each system's intersections with the other systems. Several of the systems are already considered old, like The "chat" tab in an old Google Doc, but some people keep using them, which is part of the joke. There only seems to be one "chat" system which could in no way be said to be an on-line chat system, and that is the Wall (bathroom) at the bottom, which refers to how people writes notes on public bathroom walls, making it an extra joke and possibly a reference to 229: Graffiti.

In the title text, Randall explains how he is one of the only few Instagram users to use the UNIX 'talk' gateway (an old peer-to-peer chat system whereby users logged into the same UNIX system could privately communicate with each other in a full-screen interface.) But he doesn't tell how he had enhanced this old fashioned software.

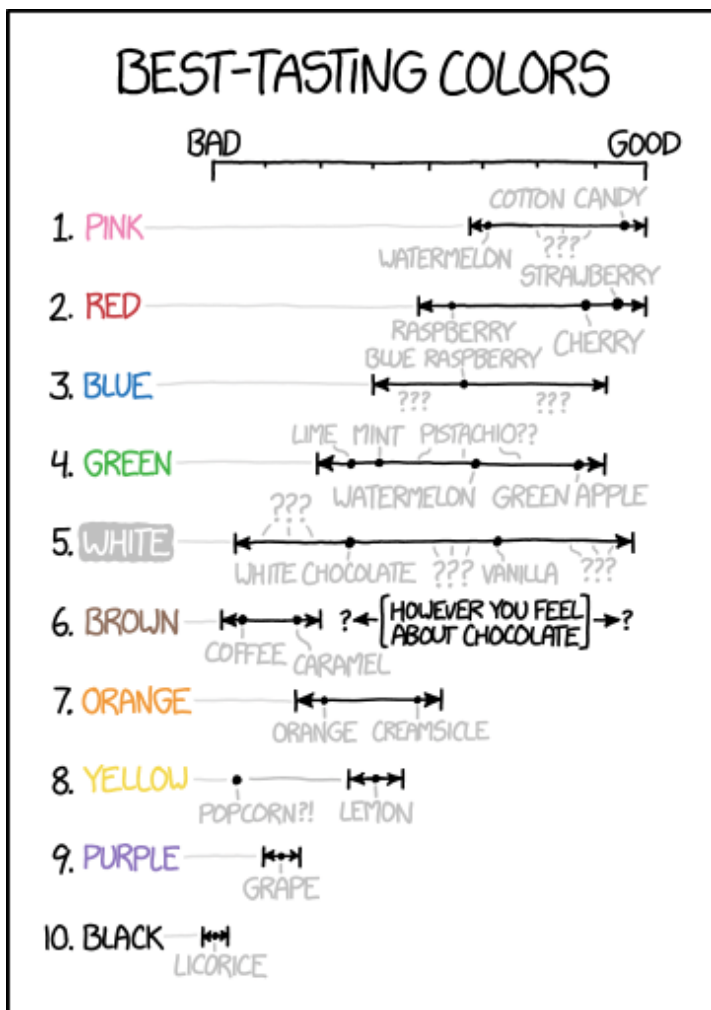
Note that this is similar to the earlier 949: File Transfer.

Chat systems[edit]

The 24 chat systems with the number of stick figures inside are listed. Notice there are only 23 real systems, as one of the systems is a bathroom wall.

#1811: Best-Tasting Colors

March 15, 2017



I recognize that chocolate is its own thing on which reasonable people may differ. Everything else here is objective fact.

Explanation

In this comic, Randall rates colors based on tastiness of various flavors, which makes it very similar to 388: Fuck Grapefruit. The colors are sorted in descending order (from most tasty to least tasty) by the midpoint of their overall taste range. However, since these foods are all commonly imitated for artificial flavorings, and the colors are consistent with the standard food colorings used as dye in candies with these flavorings, it's likely that this is Randall's rating of artificial flavors rather than the actual products.

Within each color, several individual items are placed at points marked by dots along a tastiness scale, with nine ticks ranging from bad (1) to good (9). For example, within the pink color band at the very top, watermelon is only rated 6/9 — much less tasty than cotton candy, which is almost at 9/9, making it the very best tasting flavor in the chart. Interestingly, watermelon is mentioned twice, as it is also listed under green. Usually people do not eat the green part of a watermelon,[citation needed] so it is strange that Randall has rated both types at almost the same level of tastiness. It could be that he sees the green watermelon as green, but also sees the pink fruit inside, so it is actually the pink fruit that is rated for both colors, or the chart is a rating of candy (such as jellybean or popsicle) flavors, as it is not uncommon for both green and pink to represent watermelon in those situations.

For pink, blue and white there are one, two and three regions, respectively labeled with "???". It is not clear what the purpose of these is. Perhaps they indicate regions in which Randall is unable to think of any examples, and is inviting the reader to speculate. For instance, are there any pink-colored foods more tasty than watermelon (6/9) but less tasty than cotton candy (8.5/9)? It could also be that he thinks there must be other interesting foods with this color, which could seem to be the case for white and blue, where there are a group of question marks above the most tasty labeled flavor blue raspberries and vanilla for white. The latter is yet a joke, as vanilla is black, but is often used in white food such as vanilla ice, which he may have been thinking off, or just again messes with his readers.

The question marks thus imply an arbitrary tastiness assigned to a color that is not derived from an actual data point, however. For instance, the only blue datapoint is "blue raspberry", assigned a ranking of 5.5. But the range assigned to blue as a whole is 4 to 8. The regions on either side of the blue raspberry dot are labeled with ???.

There are a few exceptions with chocolate the most obvious as Randall makes a wide range for chocolate for brown, ranging from 2.5-9.5 out of 9. And the arrows here ends in single question marks indicating that the range could be even longer. In the title text he acknowledges the fact chocolate is its own thing and that regarding its taste reasonable people may differ in opinion.

The region for chocolate could not go further down because below the section for chocolate for brown food, there is another range with some other brown food items that Randall really does not like, caramel and especially coffee at 1.5/9. It may seem that Randall has never grown up to drink the drinks that society often dictates that you should drink. Not drinking Coffee (or hating it when you do) can be a problem with all the coffee breaks and meetings held over coffee etc. And as Randall has shown in 1534: Beer he also doesn't like beer...

Although it is not so clear as with chocolate pistachio is also split up with three lines indicating a range on the green from about 5 to 7 without any assigned point to their taste. And finally popcorn at 1.5/9 simply falls below the otherwise already low and slim rating range for yellow foods (2.5-3.5) with only lemon at 3/9 included. Many people love popcorn, but not especially for the corns actual taste, which is non existing if not for the adding of salt or sugar or other additives.

The worst taste by far to Randall, though, is licorice, and black food has a very small range from almost below 1 to less than 1.5. In USA it seems few people like licorice (although as most of the other mentioned food items, it may come in a wide variety of flavors and strengths). But in for instance northern Europe (Scandinavia) many people love it. See more explanations for all the mentioned flavors in the table below. It also seems that Randall's taste has changed over the nine years since the grapefruit comic.

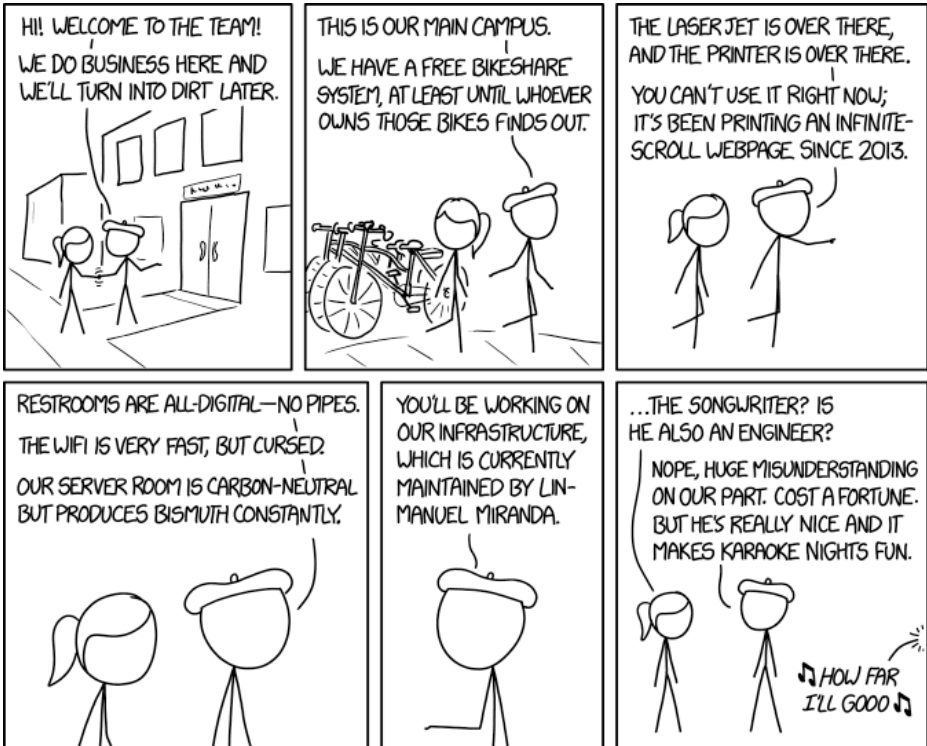
In the title text, Randall asserts that his rankings of colors and flavors are indisputable (with the exception of chocolate). This together with rather obscure flavors included ("blue raspberry", "creamsicle") rather than more obvious choices, such as banana for yellow and carrot for orange could be a jab at the reception of his first food ranking comic, 388: Fuck Grapefruit which ranked fruits based on their tastiness and ease of consumption. Randall claims that it is the most controversial piece he has ever published. So all this is maybe just a way to generate even more controversy about this comic, and based on the discussion below he may have succeeded.

In 882: Significant researchers were studying the effect of eating 20 differently colored types of jelly beans (and all colors here are included except white).

Table of foods[edit]

#1812: Onboarding

March 17, 2017



'So we just have a steady flow of metal piling up in our server room? Isn't that a problem?' 'Yeah, you should bring that up at our next bismuth meeting.'

Explanation

This is another one of Beret Guy's mysterious businesses, in which he shows new employee Ponytail around the building in which the company resides. The process of showing a new employee around the business and starting to get them introduced to people and systems and procedures is often referred to as "onboarding" - hence the title of the comic.

Existential Welcome[edit]

The first panel starts out as a typical welcoming of the new employee to a small indie business. Very quickly, however, Beret Guy's explanation jumps to an existential viewpoint. Very rarely do conversations or introductions involve discussing the eventual fate of our bodies, and certainly not in a professional light as in this comic. Beret Guy, however, has no problem with discussing death and decay as just part of his business. This seemingly contradicts the title text in 1493: Meeting, where it is claimed that employees of the company can not physically die. However, this could be a new company he has started since then. Alternatively, this is a literal statement, perhaps related to the cursed Wi-Fi mentioned later in the comic.

Bikeshare[edit]

In the second panel, Beret Guy shows Ponytail the free bikeshare system this business apparently has in place. Bikesharing is a system in which many users share one or more bikes among themselves. Typically the bikes belong to some of the members of the group who are allowing them to be used by other members

who may not have one, but Beret Guy calmly remarks that this system will only exist "until whoever owns those bikes finds out", implying that they were not donated or shared by any member of the group, but are being used without permission or the knowledge of the true owner of the bikes. This is, thus, not actually a bikeshare, and would be more properly described as theft.

Printer[edit]

In the third panel, Beret Guy shows Ponytail that the laserjet is over there and the printer is over there, thus indicating that the laserjet is not a printer. This is a bit disconcerting, since the HP LaserJet is in fact a common brand of laser printer, suggesting that his laserjet may be some rather more exotic device, such as a laser-propelled jet aircraft. In any case, however, the printer is not available, as it's been printing an infinite-scroll web page since 2013.

An infinite-scrolling web page is a web page that, as the name implies, seems to have no end. This style of webpage typically has no definite pages or sections, but instead continues to feed data to the screen as the user scrolls. One such example is [endless.horse](#), a webpage that features an infinitely tall horse. In reality, trying to print one of these would only print the current section the user was viewing, and even if it was somehow able to infinitely print, the operator could theoretically cancel the operation at any time. Presumably, this continuous printing serves some useful purpose, e.g. prints latest news, because someone would have to be refilling the paper for the printer to have kept running this long; it would have run out of paper long ago otherwise. Mistaken print jobs are sometimes notoriously difficult to stop due to many levels of

buffering (application, printer driver, OS spooler, print server, printer device) and lapses in job control software.

Infinite scrolling (in the sense of an annoying UI design style for browsing large but finite documents) was previously covered in 1309: Infinite Scrolling. A similar separation of the phrase "laserjet printer" has been explored in 1681: Laser Products.

Infrastructure Buzzwords[edit]

In the fourth panel, Beret Guy makes three more remarks.

Restrooms are all-digital—no pipes. While many technology standards nowadays are entirely digital, one's restroom is one of the things that most definitely should not be.[citation needed] A restroom without pipes would have no way to bring water in and transfer wastes away, and would most certainly be at the very least an unpleasant encounter. (It's implied that the waste is being transferred digitally, although this is obviously impossible.) This could also be a pun joking with the fact that a common (in the past and reappearing recently) technology in sound amplifiers is the use of tubes, but nowadays most sound amplifiers are all-digital. So a "latest technology" restroom cannot have pipes (synonym of tubes) and has to be all-digital.

The Wi-Fi is very fast, but cursed. Fast Wi-Fi is certainly desirable, but in this case, he claims it is also cursed. Whether the curse is a side-effect of the fast Wi-Fi or totally unrelated is left unsaid, as well as what the curse is. This could possibly be a joke relating to American slang: all technology can behave inexplicably from time to time, and Wi-Fi is notorious for randomly losing connection -- this is often exaggerated and called "cursed". Knowing Beret Guy, though, it's probably literal, perhaps purchased from one of the

"mysterious shops that sell you magical items, and then it turns out they're cursed".

Our server room is carbon-neutral but produces bismuth constantly. Normally, carbon-neutral would mean that it is designed to be environmentally friendly by reducing and offsetting its carbon emissions enough that it has no net effect on the environment. The term is a little bit confusing because the meaning is of course carbon-dioxide-neutral. Instead of producing carbon-dioxide as a side-effect of its power usage, Beret Guy's server room produces the element bismuth, which is absurd. Bismuth is used as lead replacement in some solders. While this replacement is often used because of the toxicity of lead, in this case it refers to an IBM mainframe computer where the Bi58Sn42 alloy is used because of its low temperature soldering characteristics. Therefore, producing excess bismuth in the server room would destroy all the electric connections.

One way the server room might produce bismuth is a compact nuclear reactor which can both make the server room carbon-neutral and leak bismuth (by creating it in the reactor). This being Beret Guy, another possibility is that bismuth simply appears in that room as the server operates, because he didn't want it to create carbon emissions and so it had to emit something else.

Lin-Manuel Miranda[edit]

In the last two panels, Beret Guy explains that Ponytail will be working on the infrastructure, which is apparently maintained by Lin-Manuel Miranda. He is among other things a songwriter but certainly not an engineer or anyone qualified to be responsible for an entire infrastructure.[citation needed] Ponytail knows about

his songs and thus surprised asks if he is also an engineer. (This echoes 1665: City Talk Pages, which includes a train station designed by Andrew Lloyd Webber, a composer best known for writing *The Phantom of the Opera*).

It is worth noting that Beret Guy actually acknowledges the mistake here, claiming the mistake "cost a fortune." This is unusual for Beret Guy, as he has of yet failed to acknowledge or recognize the oddity of every other aspect of his mysterious business, many of which are certainly stranger than this. However, he doesn't seem to mind this at all and does not wish to fire him. Instead he plans on fixing the mistake by hiring a real network engineer, Ponytail, to do the work alongside Miranda. Because, as Beret Guy continues to explain, the bright side of having Lin-Manuel Miranda in his business overshadows the lost fortune. Apparently Lin-Manuel Miranda is really nice and he makes karaoke nights fun, a clear reference to his engaging stage presence and vocal skills.

Off screen, Lin-Manuel Miranda is heard singing "How Far I'll Go", which is a song that he composed for the Disney movie *Moana*. It was nominated for an Oscar for Best Original Song in the 2017 show just a few weeks prior to this comic.

Title Text[edit]

The title text mentions the potential dangers of having your server room constantly produce bismuth, but only as a prelude to a bismuth/business pun. Because of the earlier carbon reference, it could also be a parallel to the difficulty in convincing businesses to become more energy efficient and reduce greenhouse gas emissions despite the urgency, as Randall has often referred to in

xkcd with 1732: Earth Temperature Timeline.

The fact that the business has meetings to discuss the bismuth, but apparently no one has ever mentioned at one of these meetings that the bismuth may be a problem, is strange. It is unclear what participants in these meetings ordinarily say about the bismuth.

#1813: Vomiting Emoji

March 20, 2017



U+1F93F VOMITING MODIFIER

-  U+1F920 U+1F93F VOMITING COULBOY
-  U+1F5FD U+1F93F VOMITING STATUE OF LIBERTY
-  U+1F54A U+1F93F VOMITING DOVE
-  U+1F31B U+1F93F VOMITING MOON
-  U+1F680 U+1F93F VOMITING ROCKET SHIP
-  U+270B U+1F93F VOMITING HAND

My favorite might be U+1F609 U+1F93F WINKING FACE VOMITING.

Explanation

This comic relates to the recent Emoji v5.0 proposal for Unicode 10.0 which includes a vomiting emoji. Cueball initially states that the newly proposed emoji look good, until Megan points out the existence of the vomiting emoji. While Cueball finds this distasteful, Megan rather seems to like it, going as far as suggesting rather than a single emoji, it should be possible to have a whole array of vomiting emojis by combining the vomiting action with other existing emojis.

Unicode is the computing industry standard for representing text. More recent additions have included emoji characters, such as grinning face (😊) or hands clapping (👏). Each Unicode character is assigned a numerical code, usually written in hexadecimal notation. For example, the grinning face emoji is assigned the code U+1F601, and the clap symbol is assigned U+1F44F. Unicode also supports "combining modifiers" which allow, among other uses, placing accents on letters, adding decorations to other emojis, or changing the colors of flags or skin tones. For example, letters such as A, O, or n together with a combining tilde (U+0303) modifier result in those letters having a tilde glyph on top (Ã, Õ, ñ), and various emojis for people, such as 🧑 or 🧒, together with the medium-dark skin tone modifier (U+1F3FE), results in those same people with altered skin color (🧑🏭, 🧒🏭).

Along the same lines, Megan's proposal is to assign the

code U+1F93F to be a combining modifier indicating vomiting. Under this proposal, it would theoretically be possible to combine a vomiting modifier with any emoji to produce a vomiting version of that emoji. Six examples are given in the last panel, with each being progressively more nonsensical. The title text continues this and gives another example of a ridiculous combination.

The examples given in the comic are:

- Vomiting Cowboy (🤮): This seems reasonable and not much worse off than the regular one.
- Vomiting Statue of Liberty (🤮): Given the turbulent political climate in present-day America, this emoji might see a lot of use by opinionated folks.
- Vomiting Dove (🤮): As the dove is usually seen as a symbol of peace, a vomiting one could be construed as an omen for war or used to depict strong objection to ongoing conflicts. It may also reference a tendency for birds to drop unpleasant things on people below. It is worth noting that pigeons are a subspecies of doves so a dove emoji might as well represent a flying pigeon.
- Vomiting Moon (🤮): In cartoons or fairy tales, the Moon is often anthropomorphized, however depicting it as vomiting would be extraordinary since that would not be in line with normal child-friendly material.
- Vomiting rocket ship (🚀): This might be a reference to the "Vomit Comet" aircraft that astronauts train on. Also, space travel and travel in general (e.g. in cars,

roller coasters, airplanes) can all be associated with vomiting. However, since the cabins of rocket ships should be airtight when in flight, vomit coming out of a flying rocket would be quite strange. While it would be hazardous to have vomit floating around in a weightless environment, the situation would more usually be prevented by carefully containing the vomit, and/or by using anti-nausea medication.

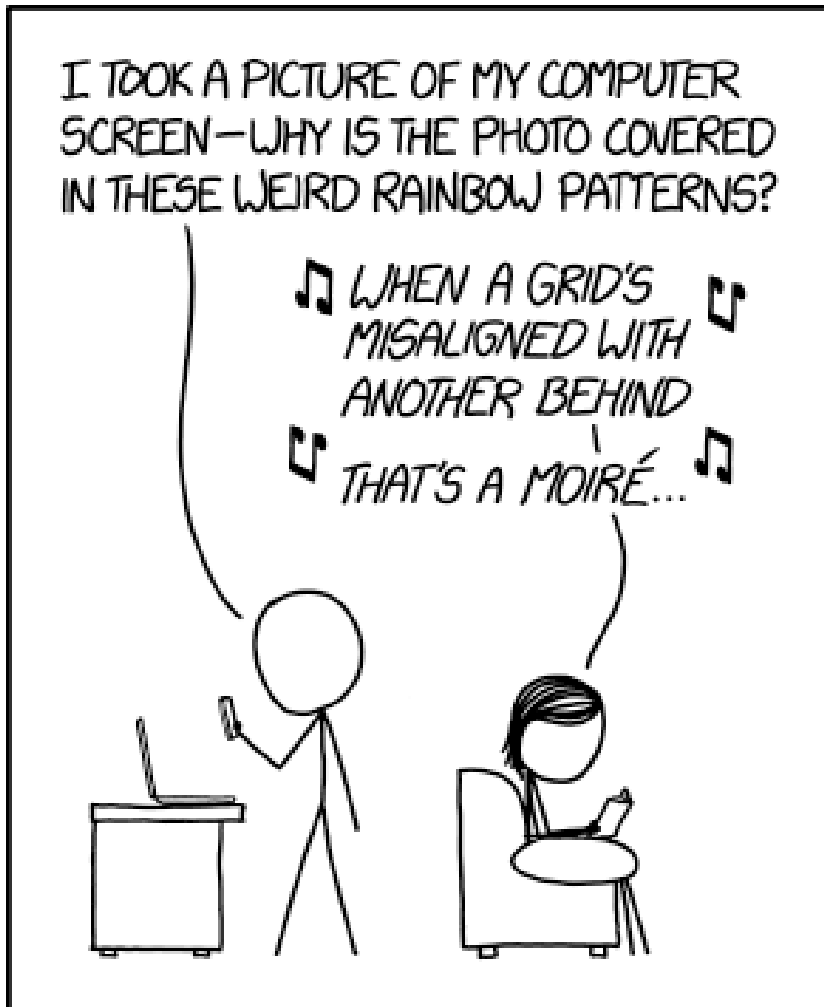
- Vomiting Hand (🤮): This one is just bizarre[citation needed]. Maybe it could be used in the context of some horror flick?
- Winking Face Vomiting (👁️🤮, title text): This suggests that the context in which a wink is used is combined with vomiting to humorous effect.

Assigning Unicode characters to emojis has been controversial historically due to the fact that Unicode was created as a standard for text. Emojis, which are essentially drawings of people or objects, aren't typically perceived as parts of text, and so leads some to object to co-opting the standard for non-text things. Using combining modifiers to further expand emojis is also seen as an abuse of the original purpose of modifier characters. As an alternative, emoji zero-width joiner sequences are in use, where an emoji is encoded as a series of simpler emoji and zero-width joiners. In practice, this would probably be how the above characters would be implemented, instead of with a combining modifier. Jokes that make fun of Unicode, involving emojis that shouldn't exist or inappropriate combinations thereof, are fairly common on the Internet.

In the title text of 1726: Unicode, Randall mentioned the proposed "brontosaurus" emoji in Unicode. And shortly before that Megan talked in similarly drawn emojis in 1709: Inflection. In general emoji has become a recurrent topic on xkcd.

#1814: Color Pattern

March 22, 2017



When the spacing is tight / And the difference is slight /
That's a moir

Explanation

The comic references moiré patterns in a parody of the song “That’s Amore” made famous by Dean Martin in 1953. (See trivia for pronunciation).

In mathematics, physics, and art, moiré patterns or moiré fringes are a kind of aliasing -- large scale interference patterns that can be produced when an opaque ruled pattern with transparent gaps is overlaid on another similar pattern. For the moiré interference pattern to appear, the two patterns must not be completely identical in that they must be displaced, rotated, etc., or have different but similar pitch. Moiré patterns appear in many different situations. In printing, the printed pattern of dots can negatively interfere with the image. In television and digital photography, a pattern on an object being photographed can interfere with the shape of the light sensors to generate unwanted artifacts.

In digital photography or videography, moiré patterns occur when the pattern of pixels on the image sensor are not 100% identically aligned with patterns on the subject being photographed. Photographs of a digital screen taken with a digital camera often exhibit moiré patterns, since it is very difficult to align the camera sensor’s grid with the screen’s pixel grid perfectly. This is the problem Cueball ran into, where the photo he just took of his computer screen is covered in weird rainbow patterns (the color patterns from the title). It is possible to reduce this effect by changing the distance and angle between

the camera and the screen. There can also be bands of uneven brightness on digital photos or videos of electronic displays, those are caused by scan lines and are different from the moiré patterns described in this comic.

Megan responds to Cueball's complaint with a song that explains moiré patterns. Her song is a parody of the song *That's Amore*, where "Amore" means "love" in Italian. The pun is that "That's a Moiré" and "That's Amore" are phonetically quite similar. The title text continues the song with a second verse, again with musical notes indicating that it should be sung. More information on when moiré patterns occur is given here, indicating that the space between the grid lines should be small and the two grids should be almost identical, for the maximum moiré effect. This verse, however, could also work if a moiré was changed to amore, as two people squeezed tight together, and without much difference between them could lead to a romantic relationship.

Randall was not the first to spoof this song using "a moiré" instead of "Amore". His two verse version, two verses from the original song, and other prior versions can be found below.

It is the second time that Randall has changed the lyrics to "That's Amore", although the first time, in 321: Thighs, he only changed eye to thigh in the original versions first verse.

The songs[edit]

It turns out that Randall was not the first to spot the possibility of

changing the lyrics from "That's Amore" to "That's a Moiré." Verses are shown below as follows: the lyrics first to the original song, then to Randall's song from this comic, and below that other songs (with citations).

The two first verse in the original song:

The entire version of Megan's (Randall's) song is:

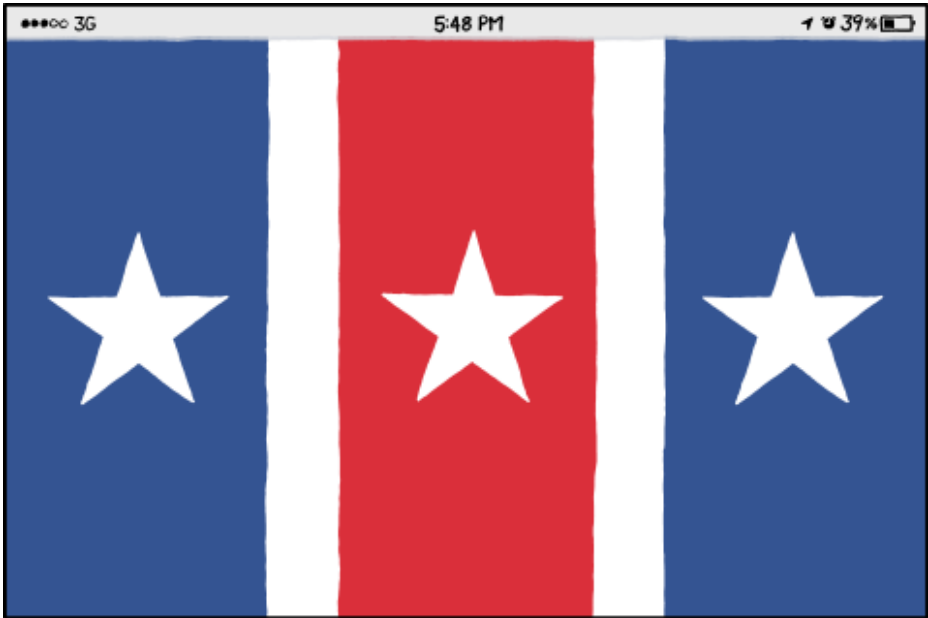
A similar song based on the same pun was made by Craig Swanson in 1993 and can be found on his web comic Perspicuity in this comic: That's a Moiré. His song text was:

Jamie Zawinski and Michael Bayne wrote a similar verse for the Moiré screensaver they made in 1997 (search for that's to find it on the linked page):

Randall also mentions this song in Chapter 20 of What If? 2.

#1815: Flag

March 24, 2017



THE DESIGN COMMITTEE FIRED ME ONCE THEY REALIZED THAT MY EDITING PROCESS INVOLVED A SCREENSHOT, BUT IT WAS TOO LATE.

UNTIL THEY CHANGE IT, OUR NEW COUNTRY HAS THE ONLY NATIONAL FLAG TO INCLUDE A PHONE NOTIFICATION BAR.

There's a compromise bill to keep the notification bar but at least charge the battery.

Explanation

Presumably Randall was hired by a committee to propose a new flag for an unspecified country. His process of editing the flag involved taking a screenshot of his design to export it, a mistake that went unnoticed by anyone until the flag was officially implemented.

Once the problem was pointed out, the design committee placed the blame on Randall, but could not immediately undo their decision until new suggestions had been submitted and a new committee could agree on another design. Thus the country is now stuck with this design, making it the only country with such a bar in the flag.

The title text mentions a compromise bill that will change the flag. This implies that the flag was approved with the status bar included. Apparently, there is some controversy about removing the status bar from the flag, as the compromise bill proposes keeping the status bar and changing the displayed percentage of the battery from 39% to 100%. This may be wordplay on the term "charge" as used in vexillology, where it refers to a figure appearing on the background of the flag. It may also be a reference to 1373: Screenshot.

Flag design[edit]

The bar in notification bar, is a vexillological descriptor, as in the "Stars and Bars," a term used for the first flag of the Confederate States of America, not to be confused with the counting

technique.

Flags are often minimalist and involve geometric shapes and solid colors. A notification bar at the top of the flag would clash with these design elements and look unprofessional.[citation needed] The flag in the comic is otherwise well-designed, conforming with a principle of heraldry and vexillology known as the rule of tincture: the "metals" consist of white/silver and yellow/gold, while the "colors" consist of red, blue, green, black, and purple; anything in the "metal" category should only be placed upon a background of the "color" category and vice versa.

The elements of the flag's intended design—the colors red, white, and blue; the use of stripes; and the star emblems—are the same that are used in the American flag the Stars and Stripes.

The elements of this flag are, however, also present in several other existing flags, like those derived from Union Jack, the flag of the United Kingdom, and like the flags of Australia and New Zealand. They are also in the flags of North Korea, Liberia, and Malaysia. The flags from USA, Australia, Liberia and Chile have white stars, and those of USA and Liberia have white bars as well.

Theories[edit]

The low battery status might imply that the country is low on resources. It thus seems like people have taken the reference to modern times smartphones to their hearts and actually wish to have this very modern design.

But if they indeed continue with this idea, thinking that their country would look better with a full battery charge, they might also consider changing the 3G connection to the newer 4G or 5G

version, according to what was available at that time in that location, and giving the phone a full signal (5/5 instead of only 3/5 dots). And maybe also choose a time that would mean something rather than 5:48 PM. For instance noon/midnight, or 8:00.

The reason such a status bar could be missed in the first place could be that most people today look at pictures on their smartphones all the time, and thus their own phone's status bar is indirectly included at the top of all the pictures they see. People thus do not notice these status bars any longer as they are always there and clearly not important for the picture. Randall has mentioned before, in 1373: Screenshot, that he cannot take smartphone screenshots seriously if the battery of the device is low, as he cannot focus on the content, becoming afraid his own device is running out of power—a problem that only occurs if he sees it on his smartphone, as he then becomes concerned that it is his phone that is about to run out of charge. But in this status bar, there is still 39%, enough not to cause immediate concern. His fear of losing his on-line connection like this was the joke in the comic 1802: Phone released about a month before this one.

Since Randall was asked to create this flag, it seems most likely that he would have to be a citizen of this new country. It could thus indicate that a group of states has broken free from the United States to form their own smaller union of three states, one for each star.

#1816: Mispronunciation

March 27, 2017



I pronounce epitome "EPY-tome", but EpiPen "uh-PIE-pen".

Explanation

This comic is a meta-joke where Cueball explains to White Hat which words he often spells or pronounces incorrectly. Ironically, those words happen to be words whose definitions mean "to spell incorrectly" and "being pronounced incorrectly". While describing the words he says he has trouble with, he manages to use the same words correctly in sentences both inside quotation marks (to refer to the word itself) and outside (to describe the action corresponding to those words).

The word misspell is misspelled quite often (although not in this comic!). Misspell is quite commonly misspelled as mispell or miss-spell. Some might argue that misspelled is the one word which should always be misspelled intentionally and written misspelled, so that its orthography reflects its meaning. ("If it isn't misspelled, then it isn't misspelled!")

The word mispronunciation is often misspelled and mispronounced like "mispronounciation", with the middle part like "noun" instead of "nun". This is made even more confusing by the fact that the related word, "mispronounce", does in fact have "noun" in the middle.

The punchline comes when Cueball tells that the epitome of mispronunciation is the way Cueball pronounces epitome. This is also metahumor, as epitome refers to a very good or perfect example. Thus Cueball shows the epitome of mispronunciation when he

incorrectly pronounces epitome.

The title text explains Cueball's mispronunciation of epitome. It is supposed to be pronounced in four syllables, /ə'pɪtəmi/ (uh-PIT-uh-mee), starting with a schwa, then emphasis on the second syllable pronounced like "pit", and a long E on the fourth syllable pronounced like "me". Instead, he pronounces it /'ɛpɪtoʊm/ (EPPY-tome), with emphasis on the first part pronounced like the beginning of "epic", and a silent E on the second part pronounced like "tome". The mispronounced version is what a person unfamiliar with the word might reasonably guess, given other words with similar spelling like "epicenter", "epitaph", and "episode".

EpiPen, a trademark for a type of epinephrine autoinjector (i.e. adrenaline), is brought up to further illustrate the inconsistency between spelling and pronunciation. This time the word is supposed to be pronounced with an emphasized "EPPY", but he (intentionally?) mispronounces it like "uh-PIE", possibly to match other proper nouns such as Epirus and Epione.

#1817: Incognito Mode

March 29, 2017

...BUT REMEMBER—IF YOU
BROWSE IN INCOGNITO MODE FOR
MORE THAN TWO HOURS, YOU'LL
BE TRAPPED THERE *FOREVER!*



ANIMORPHS TECH TIPS

They're really the worst tech support team. And their solutions are always the same. "This OS X update broke something." "LET'S INFILTRATE APPLE BY MORPHING APPLES!"

Explanation

A woman (maybe a different version of Blondie, or Rachel from Animorphs) warns Cueball about not browsing for more than two hours in incognito mode as he might get stuck there forever.

Incognito mode/private mode is a feature in a web browser that automatically clears any cookies and web history when the browser window is closed, but does not shield you from censorship, malware, or tracking. One could become metaphorically "trapped" in this mode if they don't want to lose this data (for example if they've found a useful page which they want to refer back to, or if they're on a website like YouTube which uses cookies to provide recommended videos and they're finding the recommendations interesting), meaning that they can never close the browser again. Presumably this is more likely to happen after a longer browsing session. The only option to keep browsing data when the incognito/private session is closed is to bookmark or write down the URLs of interesting pages; there is no way to keep the cookies (except by using features of certain browsers to view the cookies, then setting them outside of incognito mode; this is usually too complex for the average user), so things such as recommended YouTube videos from within the incognito browsing session will inevitably be lost when it is closed.

As a side note, desktop users can use a browser extension to export the list of open tabs, but mobile browsers

usually can not. However, mobile browsers might deny basic features such as saving pages and screenshots in incognito mode, making it unattractive to use. And currently, there is no way to back up cookies from incognito mode on either browser type.

Animorphs is a book series by K. A. Applegate featuring several teenagers who have a special power: they can morph into various animals whose DNA they have absorbed through alien technology. However, if they stay morphed for over two hours, they will get stuck in that form until they die (this is presumably where the "two hours" in the comic comes from).

In this comic Randall pokes fun at this by relating it to surfing in incognito mode/privacy mode in a browser. As explained above, staying for too long in incognito mode may cause the user to become "stuck" in this mode until something causes the browser to close, such as the browser/computer crashing or a power failure. This is analogous to the Animorphs who become stuck in animal form if they spend too long in that form.

An alternative interpretation revolves around the use of incognito/private browsing modes when the user is paranoid. They may use this mode if, for example, they don't want the risk of anyone else discovering what they've been doing online, and they find it safer to simply use incognito mode rather than manually deleting the relevant cookies and browsing history afterwards. If they use this mode a lot, the sense of paranoia that initially led them to use incognito mode can reinforce itself, and over

time they may become uncomfortable browsing outside of incognito mode. This is another way in which one may become "trapped" in incognito mode after extended use.

Relation to Animorphs[edit]

The caption explains that tech tips from Animorphs are the worst, i.e. the woman is an Animorph, and this was not good advice.[citation needed]

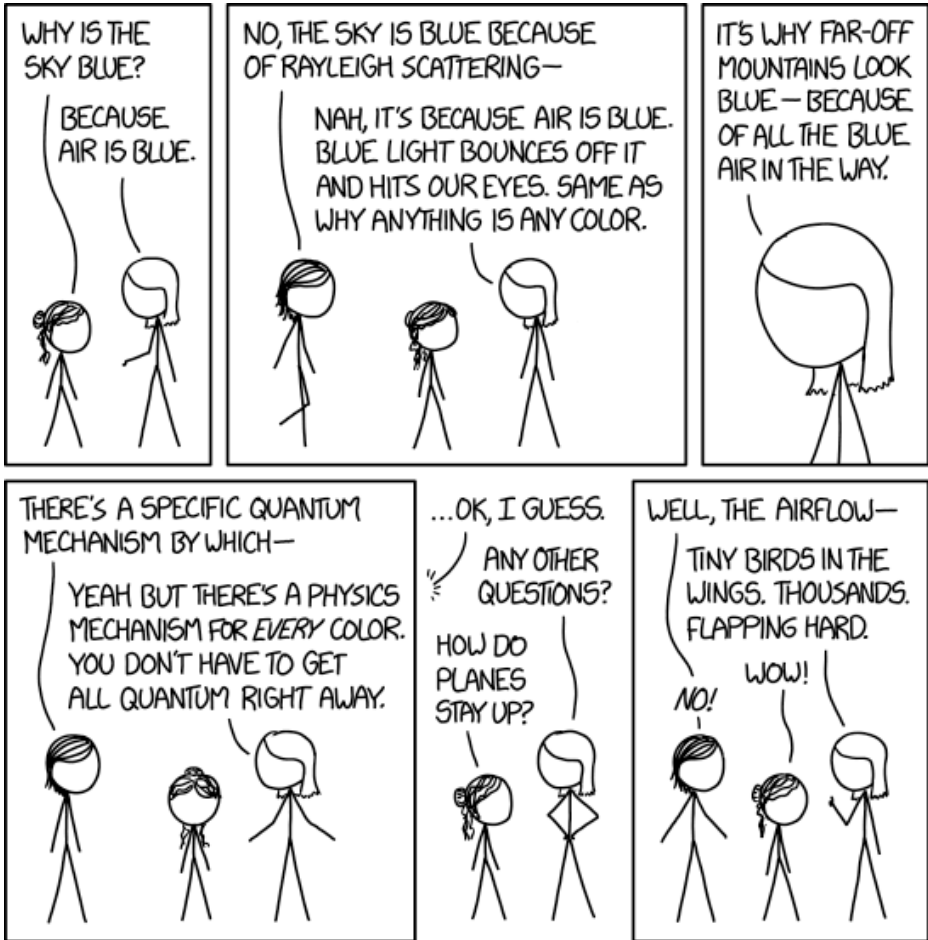
The title text continues the idea that an Animorph tech support team would be the worst possible explaining that their solutions are always the same. And then it gives an example which references a common occurrence in the Animorphs book series wherein the protagonists uses their ability to morph into animals to infiltrate enemy strongholds. In the example it is an update for Apple's OS X (a popular commercial operating system), that broke something. The solution is to infiltrate Apple by morphing apples. Morphing into fruit is nonsensical within the rules for morphing (as put forth in the books), since the children can only turn into animals (and not into fruit, like apples). It would also be very ineffective, since fruit can't move on their own.[citation needed] Plus, Apple Inc. has little to do with actual apples, so this is not a good form to infiltrate their headquarters (morphing into bugs or even Apple's employees would be more effective, and is allowed by books' rules). Randall is not the first to propose morphing into vegetables as an Animorph's parody.

Animorphs has been referenced before, first only in the title texts of 1187: Aspect Ratio and 1360: Old Files, and then later in the main comic in 1380: Manual for Civilization, with the books

being the actual manual...

#1818: Rayleigh Scattering

March 31, 2017



If you ask "why are leaves green?" the usual answer is "because they're full of chlorophyll, and chlorophyll is green," even though "why does chlorophyll scatter green light?" is a great question too.

Explanation

This comic suggests it is better to explain things in an easy-to-understand and intuitive manner, even if such explanations may not capture all of the scientific detail involved. This is especially the case for children whose ability to grasp abstract physics has not yet fully developed. Giving the most complete and physically accurate explanation would make the concepts much more elaborate than necessary and would cause major confusion in inexperienced listeners (as described explicitly in the article on *Ignotum per ignotius*).

The principle is demonstrated by the explanation on why the sky is blue. The commonly given explanation for this is, as the comic title says, Rayleigh scattering. However, in order to understand how Rayleigh scattering works to produce a blue color, one must go into quantum mechanics and deal with properties of molecules in air and their effects on different wavelengths of light. Even then, one will also need to know about the inner workings of human visual perception to realize why the color we perceive isn't the wavelength that's being most strongly scattered (see 1145: Sky Color). The child is not likely to understand this kind of explanation.

On the other hand, a much simpler explanation, such as "because air is blue" — that is, air molecules reflect blue light, in the same way blue paint reflects blue light — also, adequately explains the phenomenon and is much more understandable to less physically inclined listeners.

When Jill asks Blondie (possibly Miss Lenhart) why the sky is blue, Megan walks in and starts to explain in a very scientific way involving quantum mechanics. This is criticized by Blondie, who then convinces her that the simpler explanation is sufficient, as there is a quantum mechanical explanation for every color, there is no need to elaborate on the sky's color any more than any other object's color.

Megan implicitly accepts this, but then in the final panel, Jill asks another common question - how do planes fly? Megan starts again to give the traditional answer (airflow causing lift) but is interrupted by Blondie saying that it's because the wings of an airplane are full of small birds. While this might not be as ridiculous as it first seems (the child might later learn that the "tiny birds" are actually air molecules, and "flapping wings" are actually pressure differentials), it is certainly over-simplified to a staggering extent. Thus, Megan and Blondie illustrate the two extremes of education philosophy: where one chooses to teach the complete truth with no regard for whether it's understandable, the other chooses to make up understandable explanations with no regard for whether it's true. Arguably, neither approach is in the student's best interest and a balance needs to be achieved.

When Jill reacts like she believes Blondie's last comment about the planes, she could almost have been called April Fool. Although this comic was released one day too early for that, this was also the only year between April 1st of 2011 and April 1st of 2018 where no such comic was released. See more about this in the trivia section below.

The title text refers to another common question as for why leaves are green. This is commonly explained by the fact that they are filled with chlorophyll, a chemical used by plants for photosynthesis. Randall points out that it would be an equally valid question to ask why chlorophyll is green. This poses an interesting contrast to the answer to the question about the color of the sky, since even physicists are usually satisfied with the general explanation for leaves and don't feel the need to jump into describing quantum phenomena that cause chlorophyll to reflect green light. Also, "Why does chlorophyll scatter green light" may be a great question because chlorophyll reflects, not scatters, light and this challenges Megan-types to coherently explain the difference before they go challenging little children with pedantry. Or because green light is less efficient during photosynthesis and explaining that is similar to explaining Rayleigh Scattering.

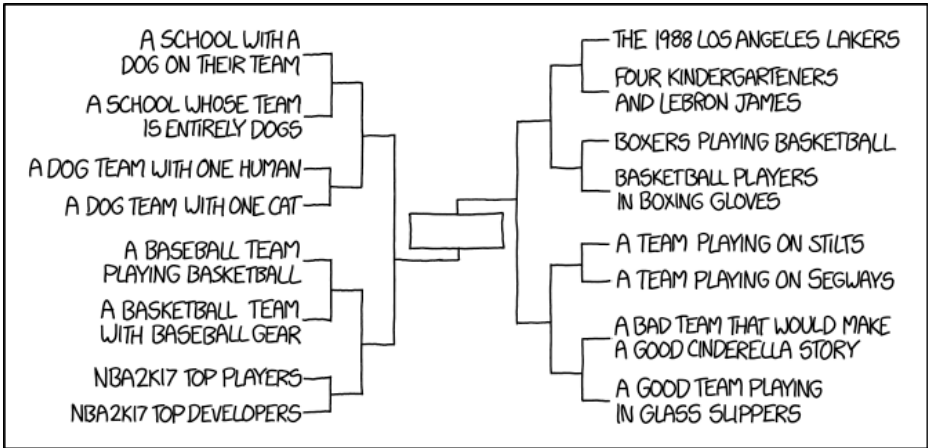
What-if 141 also mentions the simpler explanation to the original question: Sunbeam has this relevant text: "Normal light interacts with the atmosphere through Rayleigh scattering. You may have heard of Rayleigh scattering as the answer to 'why is the sky blue.' This is sort of true, but honestly, a better answer to this question might be 'because air is blue.' Sure, it appears blue for a bunch of physics reasons, but everything appears the color it is for a bunch of physics reasons." There is also a footnote in that comment with an additional example: "When you ask, 'Why is the statue of liberty green?' the answer is something like, 'The outside of the statue is

copper, so it used to be copper-colored. Over time, a layer of copper carbonate formed (through oxidation), and copper carbonate is green.' You don't say 'The statue is green because of frequency-specific absorption and scattering by surface molecules.' "

Randall himself has published *Thing Explainer* which gives simplified descriptions of complex scientific and technological objects. Even in his book, some of the more advanced details have been simplified to a toy model (such as calling liquid oxygen "cold wet air" and a nuclear reactor "box of burning metal").

#1819: Sweet 16

April 03, 2017



Every year I make out my bracket at the season, and every year it's busted before the first game when I find out which teams are playing.

Explanation

March Madness, with its championship played on the day this comic was published, is a colloquial name for the National Collegiate Athletic Association (NCAA) basketball tournament, which features 68 American college basketball teams in an elimination bracket. Due to the setup, the 16 teams that make it to the third round of the tournament (or fourth if counting the "First Four") are sometimes called the "Sweet 16", hence the title. Winning a third round game means that a team is part of the "Elite Eight," who can win to move on to the "Final Four," and then to the championship game, where a winner is crowned.

This is the second time Randall has made a bracket with strange opponents meeting each other in a bracket; the first was 1529: Bracket and brackets were mentioned a second time in 2131: Emojidome. References to basketball is a recurring subject on xkcd, as is Randall's lack of interest for sport in general.

In this comic, the bracket, see details below, of the final 16 is not filled in with actual college team names, but descriptions of the odd circumstances of each team. For example, the first team is "a school with a dog on their team", a reference to Air Bud. The team descriptions become increasingly bizarre, comprising varied sports and pop culture references and often building on and playing off of previous team descriptions.

The first four teams on the left are composed partially or completely of animals, which are most likely pets, but could be animals for assisting disabled persons, emotional support animals, police dogs, feral cats, etc. The next two teams consist of some form of baseball-basketball crossover. The bottom two teams on the left feature developers and players of NBA 2K17, a basketball video game by 2K Games.

The first team on the right, the 1988 Los Angeles Lakers is an actual historical NBA team; though the particular team from 1988 would not exist today, it could be a team of the same players, who would now be in their mid-50s or 60s. They are paired against a team of four kindergartners and current Cleveland player LeBron James (born 1984), who was also a kindergartner in 1988. James was considered the best active NBA player as of 2017. Ironically, LeBron James has since become a Laker, as of the 2019-20 NBA season; he has become the first NBA player to win a championship in 3 different teams (having previously won titles with the Miami Heat and Cleveland Cavaliers).

The next two teams feature basketball-boxing crossovers. The bracket after that features teams on unconventional mobility aids, Segways and stilts.

The final two teams are Cinderella teams. A Cinderella story is when a weak team works hard to achieve success. The final team consists of players wearing glass slippers, often a part of the Cinderella fairy tale.

The title text explains what Randall was supposedly doing to make this comic: Randall is incredibly out of touch with sports, or at least their traditions (see 1480: Super Bowl). During March Madness, a popular pastime is to take a look at the starting bracket of all 68 teams and speculate who will win each round. This is sometimes associated with gambling, where the person with the closest-to-correct bracket could potentially win money. Randall, when handed a blank bracket, instead fills it with teams he wants to see play rather than who is actually in the tournament. A bracket is considered "busted" when a number of predicted teams lose earlier than expected. In this case, since Randall's Sweet 16 does not include any of the real teams participating in the tournament, his bracket is busted from the beginning.

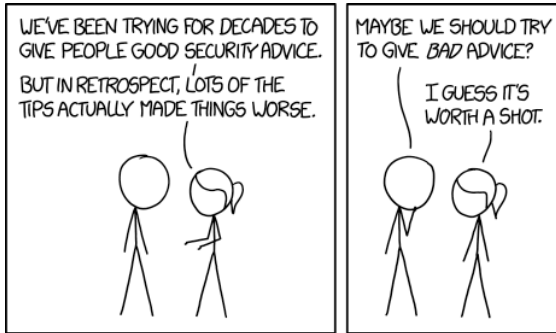
As neither this comic from April 3rd or the previous comic, 1818: Rayleigh Scattering from March 31st was one of Randall's April fools' comics, this was the first year since 2010 with no April Fools' Day comic. See more on this in the Trivia section for the previous comic.

Two years later in 2019 the April Fools' comic 2131: Emojidome, was using such a bracket as above to match 512 emojis to find the best emoji. Same time of year, so probably again a reference to March Madness.

Table of the bracket[edit]

#1820: Security Advice

April 05, 2017



SECURITY TIPS

(PRINT OUT THIS LIST AND KEEP IT IN YOUR BANK SAFE DEPOSIT BOX.)

- DON'T CLICK LINKS TO WEBSITES
- USE PRIME NUMBERS IN YOUR PASSWORD
- CHANGE YOUR PASSWORD MANAGER MONTHLY
- HOLD YOUR BREATH WHILE CROSSING THE BORDER
- INSTALL A SECURE FONT
- USE A 2-FACTOR SMOKE DETECTOR
- CHANGE YOUR MAIDEN NAME REGULARLY
- PUT STRANGE USB DRIVES IN A BAG OF RICE OVERNIGHT
- USE SPECIAL CHARACTERS LIKE & AND %
- ONLY READ CONTENT PUBLISHED THROUGH TOR.COM
- USE A BURNER'S PHONE
- GET AN SSL CERTIFICATE AND STORE IT IN A SAFE PLACE
- IF A BORDER GUARD ASKS TO EXAMINE YOUR LAPTOP, YOU HAVE A LEGAL RIGHT TO CHALLENGE THEM TO A CHESS GAME FOR YOUR SOUL.

Never give your password or bank account number to anyone who doesn't have a blue check mark next to their name.

Explanation

This is another one of Randall's Tips, this time a list of security tips.

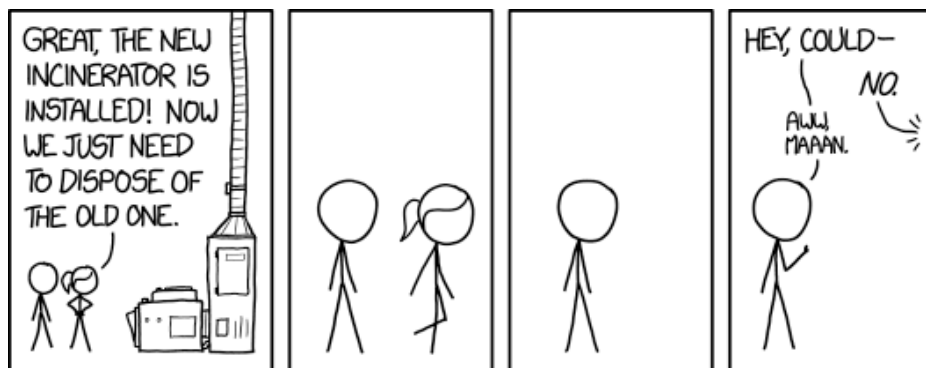
The comic depicts a conversation between Cueball and Ponytail, discussing the fact that giving people security advice in the past has failed to improve their internet security, and in some cases even made things worse. One such example is telling people to create complicated passwords containing numbers and symbols, which not only made the passwords harder to remember (leading people to create huge security risks by leaving post-it notes with their passwords on their computer monitor), but did not actually make those passwords harder to crack (see 936: Password Strength).

As a result, Cueball suggests using reverse psychology and give out bad advice instead, in hopes of achieving a positive effect. The last panel contains a list with 13 security tips, which are parodies of actual security tips. The title text is just one more tip. See table below for explanations for all 14 tips.

Security tips[edit]

#1821: Incinerator

April 07, 2017



My trash can broke recently and I had to get rid of it. When I picked it up, I suffered a brief but harrowing existential crisis.

Explanation

Cueball and Ponytail have just finished installing an incinerator, a waste disposal device which eliminates solid waste by burning it at very high temperatures. Ponytail brings up the problem of having to get rid of the old incinerator, and - after a moment's thought - Cueball begins to suggest using the new incinerator to incinerate the old one, only to immediately be shut down by Ponytail off-panel. This makes him noticeably disappointed, probably because the idea of using an incinerator to destroy an incinerator is novel to him and he wants to know what would happen.

In reality, since incinerators are designed to withstand their own high heat capacities, attempting to incinerate one would likely be ineffective, and would simply clog the active incinerator.

The title text implies that this comic was inspired by recent events at Randall's house: his trash can broke and he struggled with how to dispose of it. At least for Randall, there is something wrong with forcing anything to destroy something of its own kind -- in this case, throwing the old trash can in the new trash can. Since machines have no human emotion[citation needed] this would not cause any trauma for the machine, but the humans in charge might feel as if something is wrong, and Randall mentions having an existential crisis. This is because humans tend to project human qualities onto the machines they are working with

(anthropomorphization), thus possibly framing the situation in the context of something like cannibalism or homicide.

Another way of taking it would be in the sense of "being replaceable". Many people live without wanting to think of what might happen to everything around them after they die, but in this title text one can start comparing the trash can to themselves — the same way the trash can turns into something to be disposed and replaced with a new one after it becomes useless, what about people then? What will happen to you when you grow older? Should you suddenly go sick and become useless? How about in your job, what would happen if someone more superior than you comes around and starts threatening your hard-earned position?

Yet another interpretation is that while disposing of the trash can, Randall realized that he was now in the same situation as the trash can itself. The trash can was a tool used by others, in order to dispose of trash. And yet, in time, the trash can itself became trash and had to be disposed of by Randall. Which makes one wonder if Randall is himself a tool created/used by others, who will one day dispose of Randall when he has outlived his usefulness, the same way that he disposed of the trash can when it outlived its usefulness. From this perspective, Randall is simply a more intelligent and autonomous trash-junking-tool, different in degrees but similar in nature to his own trash can.

Many people define themselves by the things they do and

are capable of. The idea of losing those, and then being replaced for it, is a bitter pill that we will all have to swallow at some point. All things must come to end after all, including ourselves.

A more simple reason for this may be that for almost anything else you might pick up, having done so you now have the option to put it in the trash can. Picking up the trash can itself (perhaps just to work out if it is beyond use) simultaneously removes "the trash can you may opt to put something you hold in" from its usual point in your normally instinctively simple mental mapping of the domestic universe.

Plus, actually throwing out a garbage can can be surprisingly difficult.

Another device to perform a meta-action was previously explored in 952: Stud Finder.

#1822: Existential Bug Reports

April 10, 2017

ISSUE:

RECENT UPDATE BROKE
SUPPORT FOR HARDWARE
I NEED FOR MY JOB.

WORKAROUND:

IF WE WAIT LONG ENOUGH,
THE EARTH WILL EVENTUALLY
BE CONSUMED BY THE SUN.



ISSUE: If we wait long enough, the Earth will eventually be consumed by the Sun. **WORKAROUND:** None.

Explanation

Megan is sitting at her desk, writing an error report. Her description of the issue is fairly standard, albeit somewhat vague: A recent software update has broken the support for hardware she needs for her job. Most likely, she is saying that her OS is now reporting a piece of hardware is no longer supported. This is self-evidently problematic for her, as described in her error report.

The humor in this strip comes from her own suggested workaround (a short-term method of working despite the problem), which is absurd as she proposes simply waiting for the Sun to consume the Earth when it turns into a red giant towards the end of its lifetime approximately 5 billion years from now.

While this would eliminate the issue, as both the hardware and software as well as Megan and her job would all cease to exist, this would not be helpful to Megan as it does not address the underlying problem of her being unable to work in the present. 5 billion years is also far in excess of the lifespan of humans[citation needed] and operating systems alike. Lastly, as it does not allow Megan to actually continue her work, it's not strictly speaking a workaround.

In the title text, Randall asks for a workaround from Megan's "workaround". He writes it down as another bug report, as though it were a software problem. The answer is that there is none. Randall in his crisis see no

way to prevent Earth from being consumed by the Sun. However, one possible workaround could be evacuation of the Solar System, as if humanity still exists by the time the Earth's destruction occurs, we will likely have highly advanced technology. Maybe at that time it would even be possible to move the Earth, first further out to prevent both the engulfment and also the earlier evaporation of the oceans and later it could then be moved back in when the sun turns into a white dwarf. Known physics also allow various methods of reducing the Sun's mass to prevent it from becoming a red giant; these would require more energy than moving the Earth, but far less precision.

Megan has previously expressed such existential problems in 220: Philosophy, where Randall presented a solution for it. Similar she was depressed in 1111: Premiere, where it was the boiling away of the oceans, mentioned above, that was her concern.

#1823: Hottest Editors

April 12, 2017

HOTTEST EDITORS

1995 — [EMACS-VIM]
2000 — [EDITOR WAR]

2005 — VIM

2010 — NOTEPAD ++

2015 — SUBLIME TEXT

2020 — CRISPR

2025 — CRISPR (VIM
KEYBINDINGS)

Elon Musk finally blocked me from the internal Tesla repository because I wouldn't stop sending pull requests for my code supporting steering via vim keybindings.

Explanation

The comic has a play on the word 'Editor'. The editors from 1995 to 2015 are software text editors, and the editor(s) from 2020 onward are genomic editing techniques that edit DNA.

Text editors are popular among programmers and computer scientists to edit machine-readable text, as well as other digital files.

Two of the earlier editors, Vim and Emacs, traditionally use the keyboard (rather than the mouse) to perform common actions (like scrolling, marking text, saving, and searching).

As Vim and Emacs use different keyboard commands in different styles, proficiency in one editor does not make it easy to use the other.

The "Editor wars" refers to Vim and Emacs users debating heavily over which of the two editors is the best (keyboard bindings is just one argument). This debate was previously mentioned in 378: Real Programmers.

More modern editors (including Notepad++ and Sublime Text) mainly use keyboard shortcuts that are global to the operating system, again different from Vim and Emacs.

Notepad++ is a popular text and source code editor, initially released in 2003 and available only for the Windows platform.

Sublime Text is the current "most popular" text editor according to this comic; it was released in 2008.

Sublime Text, Vim, and Emacs are cross-platform.

The 2020 editor 'CRISPR' is not a text editor, but a technique used to edit DNA in a pre-existing genome. The technique has experienced a surge of recent attention in the media (beginning with the 2016 publication of "The Heroes of CRISPR" and litigation over the patent ownership), suggesting it may become the most popular "editor" in years to come. The joke lies in the comic intentionally not distinguishing between text/code editing and genome editing.

It may also suggest that we will not be editing digital plain-text files, but DNA in 2020, possibly due to very recent advances in DNA digital data storage.

Many pieces of software that contain editing functions (in text boxes, on command lines, etc.) offer Emacs and/or Vim keybindings: the keys will be (roughly) the same as in Emacs or in Vim, so that someone familiar with one of those editors can use the keyboard without learning something new.

The comic suggests that in 2025, the Vim key-bindings will be the most popular for editing genes using CRISPR.

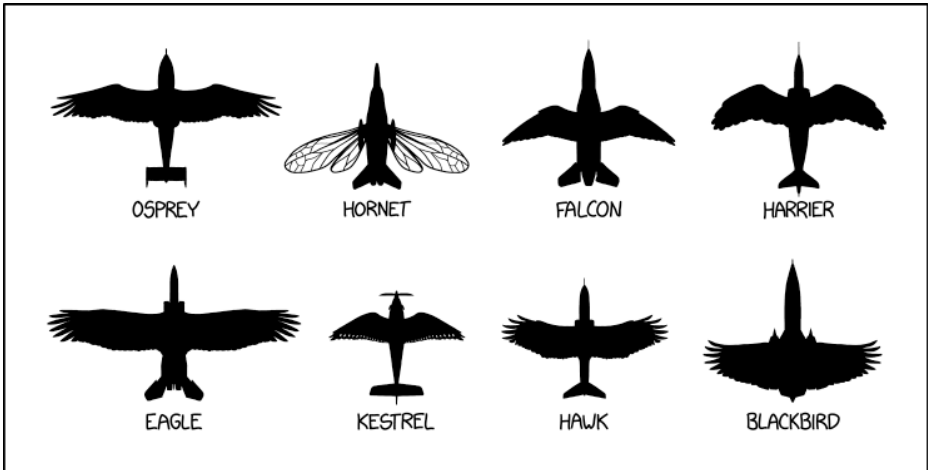
This creates a comical effect: CRISPR is a technique that operates on genes and not on digital hardware, so it does not use a keyboard per se. Consequently, it is surprising that CRISPR would have key bindings. The comic also

suggests that in 2025, Vim will make a comeback in DNA editing, thus having 'won' the battle with Emacs.

The title text says that Randall has been banned from the code base of Tesla, as he keeps sending pull requests (code changes) to steer a Tesla car using Vim keybindings. Not only does this seem implausible, but it seems dangerous to steer a car with a (computer) keyboard. The arguably most important keybindings of a text editor are those to move the editing location (the cursor) around. Vim classically uses the h, j, k, and l keys for left, down, up, and right functions, although it also supports the arrow keys present on modern keyboards. To use these in a vehicular context, up and down would probably, as in many racing games, be mapped to acceleration and braking, respectively. One additional problem with using essentially binary inputs (key pressed or not) as a replacement for a car's steering wheel is achieving different degrees of direction change. Pressing, say, the h key could either cause the car to turn its wheels left by a pre-set, fixed amount, or it could turn them left the more the longer the key is held down. There has been a spoof based on the reverse principle, however.

#1824: Identification Chart

April 14, 2017



Be careful—it's breeding season, and some of these can be *extremely* defensive of their nests.

Explanation

Some aircraft are named after creatures of flight, including birds of prey, other birds, and insects. This comic spoofs an "identification guide" of bird silhouettes, each with the fuselage of an aircraft and the wings of the flying animal from which the aircraft gets its name. All are birds with the exception of the hornet which is an insect, see the table below for individual explanations. This idea of having feathered wings on a plane is absurd, as bird wings (for birds that can fly) are made to support the lightweight structure of a bird. Supporting the metal parts of a plane along with its human pilot would be impossible.[citation needed]

General military training often includes aircraft identification. Silhouette charts are given to ground observers for memorization and reference so that friend or foe can be determined in the field. Conversely, many bird watching books will carry pictures of avian silhouettes from below, as often key details like tail and wing shape are the easiest way to determine the species of a high soaring bird, especially birds of prey. (Two comics later Cueball is out birdwatching with his friend in 1826: Birdwatching and could need such a chart, if he could spot any birds that is. A hawk, that is actually a drone, was spotted in 1910: Sky Spotters.). The pseudo-confusion between birds and planes here could be a reference to the "It's a bird! It's a plane! It's Superman" quote often used in, naturally, Superman-related entertainment. A similar joke was used

in 1792: Bird/Plane/Superman. The comic highlights not only the various designs of aircraft tails, but also bird wings. Some wings are highly adapted for soaring (eagle), speed (falcon), as well as rapid acceleration and short flights (blackbird).

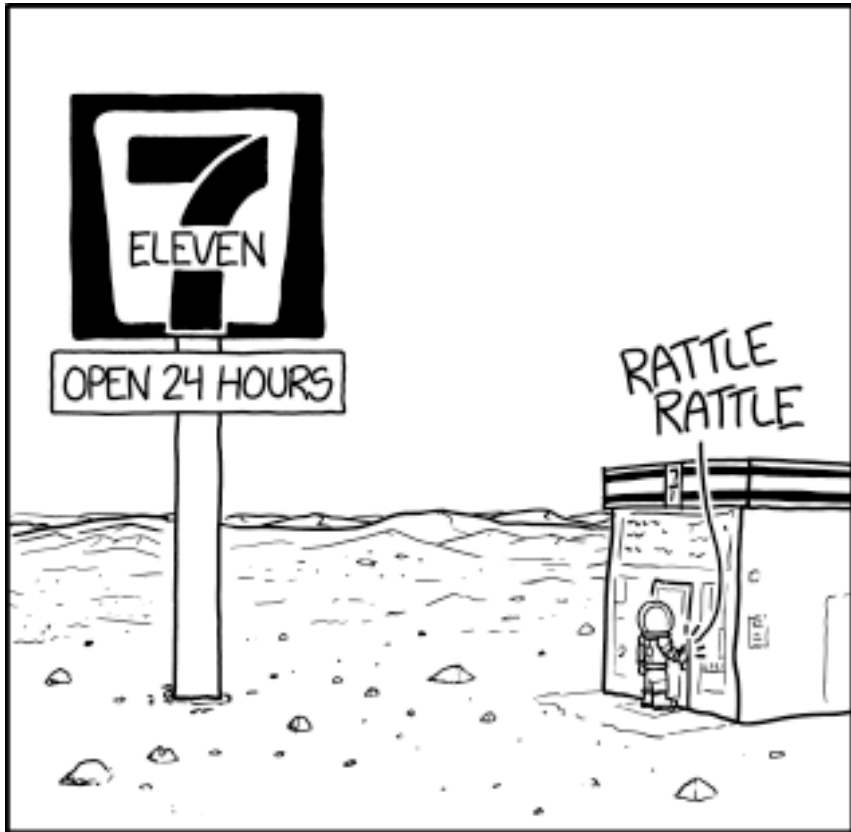
The title text is juxtaposing military air bases with breeding nests of the animals, both of which might earn a hostile response to approach at the wrong time, but in wildly different measure. Encroaching on breeding territory of some of the birds being referenced may result in getting dived at or chased, so the comparison invites the reader to imagine what might happen if the analogous creatures in the comic were defending their nest with aircraft ordnance. And if the birds were armed, with the missiles normally found on a military aircraft then imagine what would happen... This is also the second comic to refer to the military in less than two months, the first being 1803: Location Reviews reviewing a Nuclear Launch Facility.

The idea of a bird with plane engines was first used in 1729: Migrating Geese, which also shows birds in silhouette. The third last bird in the right arm of the V-formation has twin engines.

Table[edit]

#1825: 7 Eleven

April 17, 2017



I'M GLAD THEY FINALLY OPENED A 7-ELEVEN
HERE ON MARS, BUT IT'S ANNOYING HOW IT
CLOSES FOR 37 MINUTES EVERY DAY.

Really, the only honest 24-hour stores are the ones in places like Arizona and Hawaii, and many of them are still wrong in certain years.

Explanation

This comic pokes fun at the idiosyncrasies of time keeping. Since units of time are intimately tied to a planet's rotation, and planets rotate at different rates, time keeping doesn't always follow a simple pattern.

Many stores advertise being open 24/7, which means that they're open all day, every day. Many locations of the convenience store chain 7-Eleven are now "open 24 hours", again meaning they are always open (despite historically being open only from 7 AM to 11 PM local time, hence its name).

The main joke in the comic refers to the fact that a day on Mars (the time it takes for Mars to make a full rotation on its own axis) is about 24 hours and 37 minutes. If a 7-11 store is open for literally 24 hours per Mars day, then it would actually be closed for around 37 minutes each day. NASA, for its Mars missions, uses a "Mars-hour" that is one twenty-fourth of a Martian day; had the sign implicitly referred to 24 Mars-hours then the store would be open for the entire Mars day.

The duration for the Martian day used by Randall is the Martian sidereal day (how long it takes the non-Sun stars to get to the same position in the sky) of 24 hours, 37 minutes, and 22.663 seconds. However, Mars exploration missions use the Martian solar day (how long it takes the Sun to get to the same position in the sky) or sol of 24 hours, 39 minutes, and 35.244 seconds. Thus in

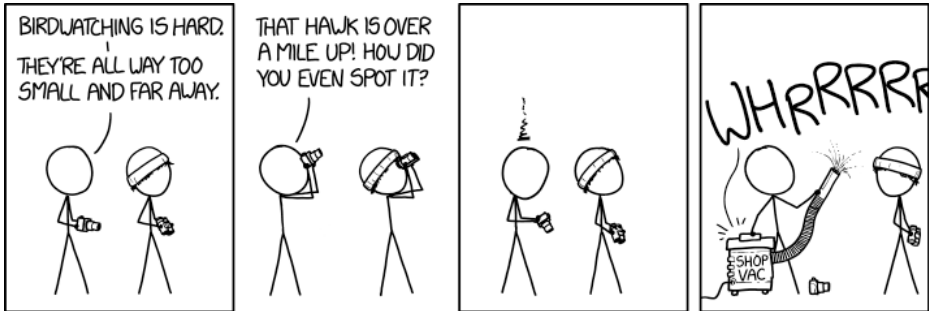
practice, the 7-11 store would be closed for 39 minutes daily instead of 37 minutes. Likewise, Earth time usually refers to solar days; a typical (mean) sidereal Earth day is 23 hours, 56 minutes, 4.0916 seconds long.

The first part of the title text refers to daylight saving time (DST), where clocks are changed on predefined days of the year in order to maximize use of available sunlight. In the United States, most places set clocks forward by one hour on the second Sunday of March, resulting in a 23-hour day, and back again on the first Sunday of November, resulting in a 25-hour day. Thus technically, even a 7-11 in the US would not truly be open "24 hours" every day. Arizona and Hawaii are called out as exceptions because they do not observe daylight saving time (except on the Navajo reservation in Arizona). Randall has made fun of DST several times before, and once again he shows his disdain for DST by saying that in the U.S., only 24-hour stores within the two states not using DST are honest. This comic came out over a month after DST began in the US.

The second part of the title text refers to leap seconds, which may be added or subtracted to the end of June or December in order to synchronize time with Earth's actual rotation. Months with a leap second will see its last day being one second longer than 24 hours. Since leap seconds apply to all Earth-based clocks, any store on Earth would not technically be open for exactly 24 hours on such days. Leap seconds have been referred to before in the title text of 1514: PermaCal.

#1826: Birdwatching

April 19, 2017



No, tell the park rangers to calm down, it's fine--I put a screen on the front. I just want to get the birds a little closer.

Explanation

In this comic, Cueball and Knit Cap are out birdwatching (hence the title). Birdwatching is an activity that involves watching birds. Usually this is done at a distance, as birds are flying in the air, and are far away. It is thus helpful to use binoculars.

Knit Cap uses binoculars and manages to spot a hawk a mile up. Cueball, however, has brought his camera, probably his superzoom camera from 1719: Superzoom. (He uses that again already two comics later in 1828: ISS Solar Transit). It is very difficult to find anything in such a camera, especially if held in one's hand (as opposed to on a tripod) and zoomed in. Maybe Cueball is with his trained friend, out birdwatching for the first time. Cueball is frustrated and comments on the difficulty and is amazed Knit Cap can spot birds over such distances.

Frustrated with his camera, Cueball comes up with a solution, which is to use a vacuum cleaner, specifically a shop vac, to pull the birds in closer so he won't need the superzoom camera to see them. This is physically impossible with such a small device. Even if the shop vac created a perfect vacuum, it can only pull out air at the speed of sound, which amounts to approximately 1 cubic meter per second considering the apparent size of the hose. This is not enough to create a significant amount of wind or affect the atmosphere. (He might've borrowed it from Beret Guy who has many strange powers that also extends to improving vacuum cleaners, which Cueball

knows about as seen in 1486: Vacuum).

Cueball's shop vac bird collector is similar in concept to vacuum-based insect collectors used by entomologists. Cueball evidently thinks that a similar concept will work to easily collect birds.

The title text refers to park rangers, who are officials in charge of protecting the natural elements (i.e. plants, animals, etc.) in many parks and would certainly object to birds being forced to coalesce via an extremely powerful vacuum. If such a vacuum were created and used for this purpose, it probably would pose a threat to the safety of birds. Cueball says he has solved this problem by placing a perforated screen in front. In doing so, he can safely attract the birds without trapping them inside the vacuum. He implies that this should remove the danger to the birds, which is not the case. While the birds can no longer enter the vacuum itself, having a large number of birds pulled into a (presumably small) screen would probably fare poorly for the birds, so Cueball's solution is rather poor.

When out birdwatching it is a great idea to have a silhouette chart to be able to recognize the birds by the shadow they make against the sky. Two comics before this one Randall made a comic with just such a chart, 1824: Identification Chart, although that was for combinations of birds and planes...

#1827: Survivorship Bias

April 21, 2017



EVERY INSPIRATIONAL SPEECH BY SOMEONE SUCCESSFUL SHOULD HAVE TO START WITH A DISCLAIMER ABOUT SURVIVORSHIP BIAS.

They say you can't argue with results, but what kind of defeatist attitude is that? If you stick with it, you can argue with **ANYTHING**.

Explanation

This comic is a parody of entrepreneurial speeches. Entrepreneurial speeches are talks, such as graduation commencements or motivational speeches. The idea behind graduation commencements is that the entrepreneur, having accumulated wisdom and experience in the process of becoming successful, will share his insights and experience to the students, in the hope that they learn lessons that will help them achieve success as well. Companies hire motivational speakers to motivate employees to work hard.

A common theme in these talks is that the entrepreneur succeeded by persisting through hardship, sometimes despite other people telling them they would be better off giving up. They advise students to do the same, and to keep pursuing their dreams even through subsequent failure. Their message can be highlighted by demonstrating such successes by visual props such as the medals they won, or images of their encounters with other notably famous people. While this isn't necessarily bad business advice, this can give students a biased vision of reality, and lead them to imagine that they will succeed as long as they keep trying.

As the title and caption both suggest, a major problem with these speeches is survivorship bias. Survivorship bias refers to an issue in statistical analysis where a significant portion of potential cases aren't available to be counted, and therefore aren't included in the statistics, which

creates a data set which is biased toward the cases that are counted. In this case, the people who are invited to and willing to give such speeches are overwhelmingly people who achieved success. People who are unsuccessful tend not to be highlighted or publicized, even if they followed the same path and made the same efforts as those who became successful. This is especially important because achieving success usually involves taking risks. If those risks pay off and result in success, a person will often be lauded as an example of achievement, but if the risk doesn't pay off, they'll often be ignored. This can result in a skewed view of how certain risks are to result in positive outcomes.

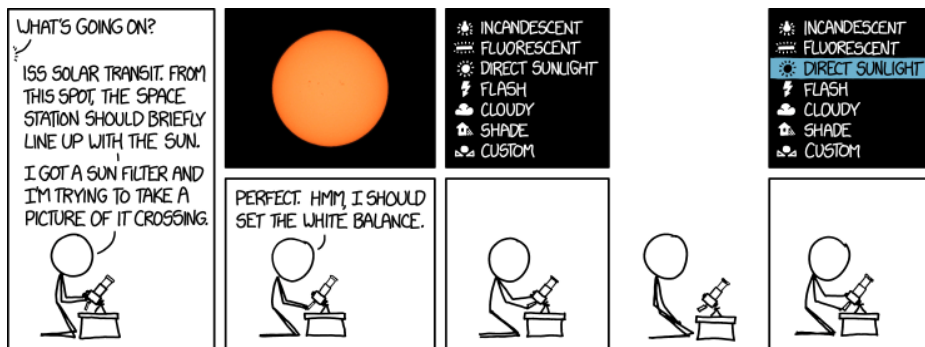
To parody this concept, the comic shows Hairy encouraging people to "never stop buying lottery tickets", and surrounded by bags of money to 'flex' their (eventual) financial success. This is an terribly unwise investment plan, because the chances of winning large jackpots are mathematically very low, even if a person buys huge numbers of tickets. With very few exceptions, people who play the lottery lose far more money than they win. But, because of the existence very large jackpots, a few people will win enough money to become genuinely wealthy. If our only exposure to lottery players is someone who won a major jackpot, it could give a false impression that continually buying tickets is a good strategy, when in reality, the odds are astronomical against making money that way. In the same way, talks from people who took risks and became successful can give us a false impression about the likelihood of success

in any other field of endeavor.

The title text continues the humor by taking two common aspects of inspirational speeches. One is the claim that "you can't argue with success", suggesting that advice from successful people must inherently be good. The other is that "if you stick with it, you can [do] anything". Randall plays those two off one another, since one is a claim of what you can't do, and the other insists that there's nothing you can't do.

#1828: ISS Solar Transit

April 24, 2017



I guess it's also the right setting for pictures of the Moon at night.

Explanation

This is the first comic in a two-comic series, released during the same week on Monday and Friday. The next comic in the series is 1830: ISS Solar Transit 2.

Cueball is trying to take a photograph of the International Space Station moving in front of the Sun (example). He has his camera with a long lens set up with a fixed setting to keep it still while he contemplates the best way to get the photographs he wants.

A normal camera is not able to take a photograph of the Sun due to the extreme brightness. This is why Cueball is using a solar filter, which makes the Sun look orange instead of white, as shown in the second panel.

Digital cameras need to determine the color temperature of a photograph to correctly display colors. This is done using the white balance setting. The joke here is that Cueball selects the "direct sunlight" option, as he feels it is the option that best suits his unusual situation of directly photographing the Sun, even though the "direct sunlight" setting is intended to be used for photographing objects directly illuminated by the Sun and not for the Sun itself.

The light from an object illuminated by "direct sunlight" is, in fact, indirect sunlight when it reaches the camera sensor; so when photographing the Sun itself, the camera receives sunlight that is even more direct than "direct".

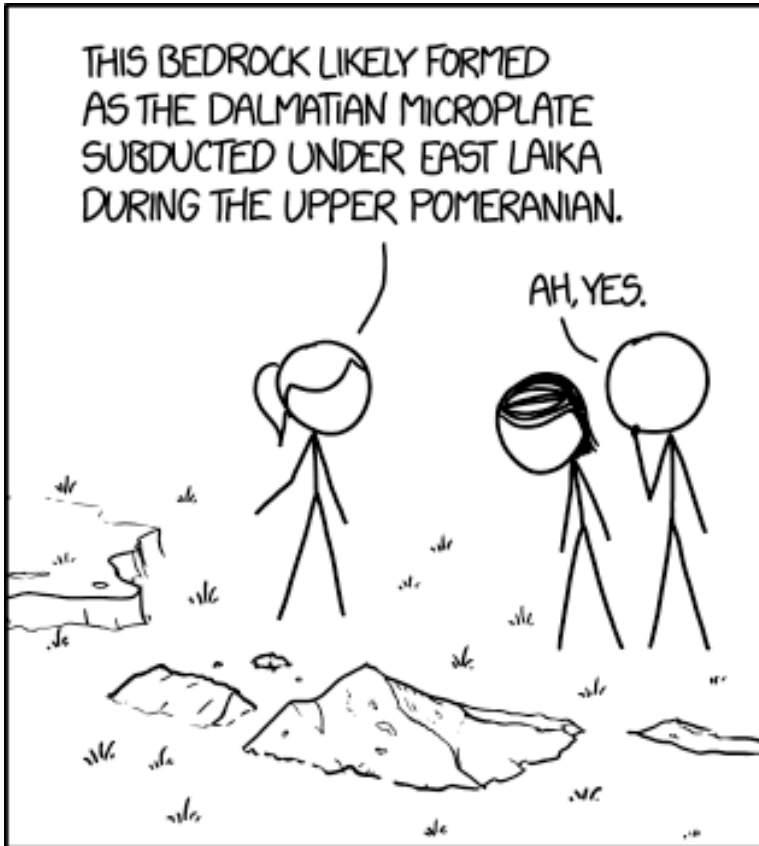
The use of a solar filter influences the color temperature, so "custom" would probably be the correct option here. A camera using the "custom" option usually requires you to focus on a white or gray object first to determine the correct setting. Most high-end cameras, like the superzoom camera that is likely depicted here, are able to capture in raw image format, allowing the user to adjust the white balance afterwards in software.

The title text is pointing out that the sunlit side of the Moon is also in direct sunlight, which is why we are able to see it, and so "direct sunlight" would actually be the correct setting in this case.

It is the second comic within a week where Cueball is using a camera, similar to the one he used in 1719: Superzoom. The previous comic was 1826: Birdwatching, two comics before this one.

#1829: Geochronology

April 26, 2017



GEOLOGY TIP: THERE ARE SO MANY MICROPLATES AND AGES THAT NO ONE REMEMBERS THEM ALL, SO IN A PINCH YOU CAN BLUFF WITH DOG BREEDS.

'The mountains near here formed when the ... Newfoundland ... microplate collided with, uhh ... Labrador.'
'Ok, now you're definitely just naming dogs.' 'Wait, no, that's actually almost correct.'

Explanation

This is another one of Randall's Tips, this time a Geology Tip.

Ponytail is describing the origin of some rock formations to Megan and Cueball. She apparently forgot the names of the microplates and the age when the subduction occurred, so she substitutes them with names of dog breeds (Dalmatian, Laika and Pomeranian) to seem knowledgeable and impress her audience.

Although no microplates or geological ages with these names exist, this is not obvious for people outside of the field, as dog breeds are often named after geographic regions. For example Dalmatia is the name of a region in Croatia, and a microplate named after it could exist (possibly as a fragment of the former Adriatic Plate). Likewise, a Laika Plate could be named after the Laika Island in Vanuatu; however, the name is unrelated to the island and originates from the Russian word лайка (lit. "barker", a generic name for several breeds of hunting dogs and also the given name of the first dog in space on Sputnik 2). Geological ages are often named after place where the first rocks dating from the age were found e.g. the Devonian is named after the English ceremonial county of Devon (aka Devonshire), while the Permian is named after the Russian city of Perm. Thus, a Pomeranian Age named after Pomerania, a region on the Baltic Sea split between Poland and Germany, might reasonably exist.

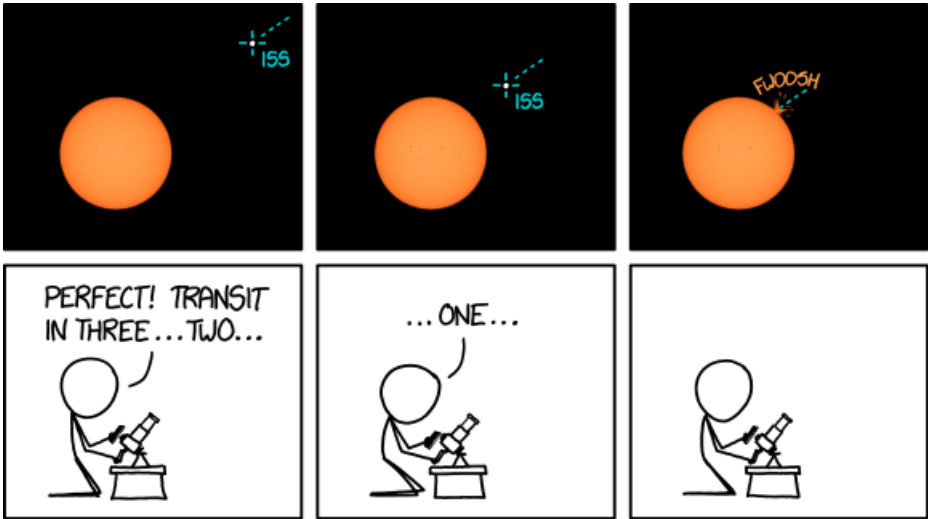
So the comic concludes in the caption with one of Randall's many tips, this time a geology tip, about how it is possible to pretend to be more knowledgeable regarding geology (and to bluff others not educated in the science) by just inserting dog breeds names instead of real names as no one remembers the names of all the microplates. An actual geologist, unlike Ponytail, would not be fooled.

The title text continues the situation until Ponytail starts to run out of dog breeds. Her audience catches on... until one of them chimes in that her "explanation" did name two real geological features: the dog breeds Labrador and Newfoundland are named after the two Canadian regions of Labrador and Newfoundland respectively. Geologically, Labrador is the easternmost section of the Canadian Shield, the ancient core of the North American continent. In contrast, Newfoundland (especially western Newfoundland) was formed from terranes, the remnants of a series of plates that collided with - and subducted beneath - North America. Some geologists have assigned the name "Newfoundland Plate" to one of these former microplates that Newfoundland now comprises. However, the title text explanation is not likely to be entirely accurate, because the most significant mountains in Newfoundland are the Long Range Mountains, which are the northernmost of the Appalachian Mountains, created when Africa and North America collided to form Pangaea; no mountain range is identified as being the result of the collision of the Newfoundland Plate with North America.

Subduction was featured in a previous comic 1388: Subduction License. And later mentioned in the title text of 3021: Seismologists.

#1830: ISS Solar Transit 2

April 28, 2017



Most people don't realize it, but they actually launch a new space station every few weeks because this keeps happening.

Explanation

This Friday comic is a continuation of the Monday comic from the same week, 1828: ISS Solar Transit, where Cueball was preparing his camera in order to capture the transit of the International Space Station (ISS) across the Sun. The comic is also made in the same special way using split panels. As noted in the first comic in the ISS series the white balance is still not set properly, because the Sun looks orange instead of white/yellow.

However, instead of transiting across the face of the Sun, the ISS crashes into the Sun. In reality, of course, this can never happen, because the ISS orbits Earth at an altitude of between 330 and 435 km, while the Earth orbits the Sun at an altitude of about 149.60 million kilometers or 1 astronomical unit. This means the minimum distance between the ISS and the Sun is only slightly less than 1 AU. Also, due to parallax, only people in a very localized region on Earth are able to see the ISS "hit" the Sun. For all others the ISS would travel past the Sun.

Additionally, even if the ISS were to somehow impact the Sun, it would not make a noticeable splash, due to being incredibly tiny compared to the Sun. It would get vaporized before reaching it. (See the what if? article Tungsten Countertop). The white dot marked as "ISS" in this strip would have to be as large as a planet. Furthermore, it would make no "Fwoosh" sound to be heard on Earth, primarily because there's a large empty vacuum between Earth and the Sun, through which

sound cannot propagate. For consistency, the "Fwoosh" might be considered exactly as diegetic as the "ISS" label, crosshair and logically even the 'splash' – if they are all real and tangible, they together show a truly massive impact, relatively speaking, that may occur across the soundless intervening void.

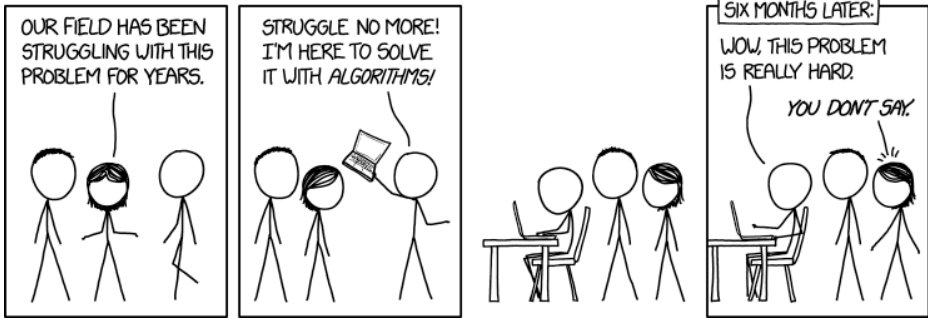
The title text plays on the event in the comic, by saying that a new space station is being launched every few weeks as the event in the comic keeps happening, with a continual series of ISSs being destroyed by crashing into the Sun on a regular basis. This is clearly implausible, as it has taken many years to build up the ISS, and there are at least three astronauts on board that would get killed a couple of times a month in that case.

It's possible that the comic is a play on conspiracy theories about space exploration, such as the moon-landing being faked. In these situations, while the government may be trying to cover up or show something different from what actually happened, amateur photographers/astronomers/radio enthusiasts (such as Cueball in this comic) claim to observe the event, independently of government or commercial sources, and see what really happened. In this case, the conspiracy theory would be that the ISS actually does crash into the Sun every few weeks, but we're made to believe that it orbits the Earth without crashing, while Cueball is able to observe what really happens with his camera. It further bears certain resemblance to the beliefs of the Flat Earth Society, which is that the Sun and Moon are only 3000 miles away from the Earth, with the

rest of the cosmos being only 100 miles further way. Were that the case, such a collision would be far less unlikely; as it is, such a collision is patently ridiculous.

#1831: Here to Help

May 01, 2017



"We TOLD you it was hard." "Yeah, but now that I'VE tried, we KNOW it's hard."

Explanation

This comic is a satire of computer programmers, who sometimes forget that not everything can be solved with an algorithm, or of the tendency to think computers are the answer to everything. In the first panel, Megan talks about how the field that she and Hairy work in has a difficult problem that many people have been working on. Cueball, believing that algorithms can solve their problem, tries to help. In the next panel, Megan and Hairy silently watch Cueball working on the problem on his laptop. Finally, six months later, Cueball concedes, and an exasperated Megan retorts sarcastically, pointing out that she had explained its difficulty six months ago within the timeline.

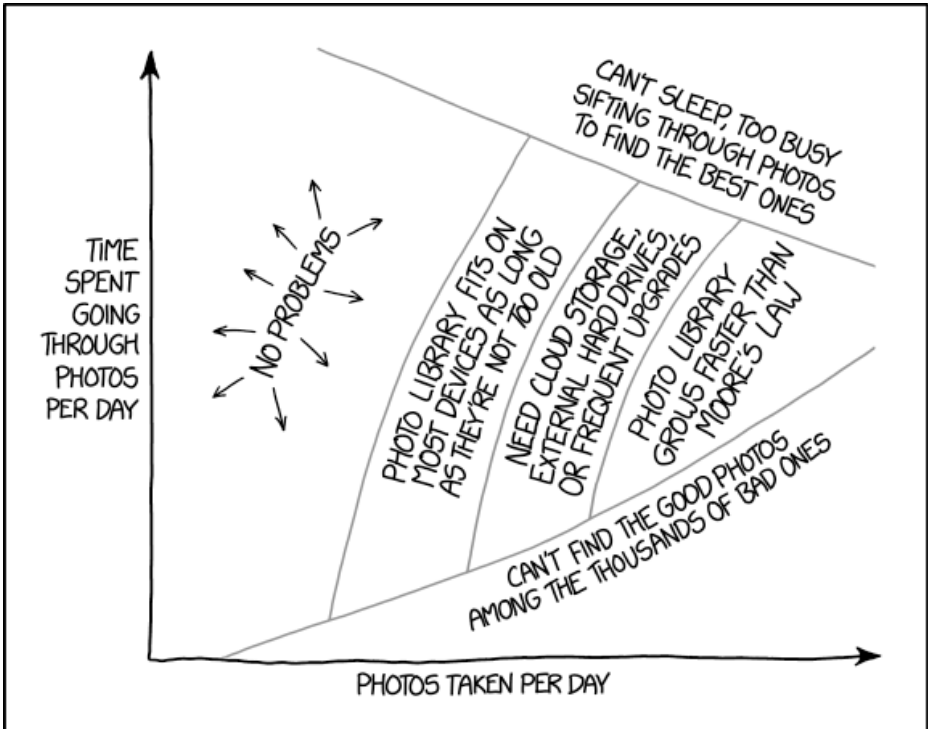
The title text furthers Cueball's apparent arrogance by showing a dialogue. Megan or Hairy says, "We TOLD you it was hard," referring to the first panel, but Cueball, still confident in his own ability's superiority, says, "Yeah, but now that I'VE tried, we KNOW it's hard." The joke is that Cueball believes that, even though he has just failed, it was his attempt which proved the difficulty, and not Megan and Hairy's work for years. The dialog references an exchange from the film *The Imitation Game*, in which Alan Turing's superior claims, "The Americans, the Russians, the French, the Germans, everyone thinks Enigma is unbreakable," and Turing replies, "Good. Let me try and we'll know for sure, won't we?"

The satire, however, applies far beyond computer programmers. It can be read as a political commentary, as in nobody knew health care could be so complicated. It is what we'd all like to see when well-meaning advice givers provide the "simple" solution to all our problems, or management provides glib advice from ten thousand feet. It is a commentary on the universal tendency to see problems as simple because we don't know what makes them hard.

This comic calls back to 793: Physicists and possibly 1570: Engineer Syllogism in central theme.

#1832: Photo Library Management

May 03, 2017



A good lifehack is to use messy and unstable systems to organize your photos. That way, every five years or so it becomes obsolete and/or collapses, and you have to open it up and pick only your favorite pictures to salvage.

Explanation

The comic is about the results of how many photos one takes. It is a graph showing multiple areas corresponding to the number of photos taken per day by a user and the total time spent reviewing them.

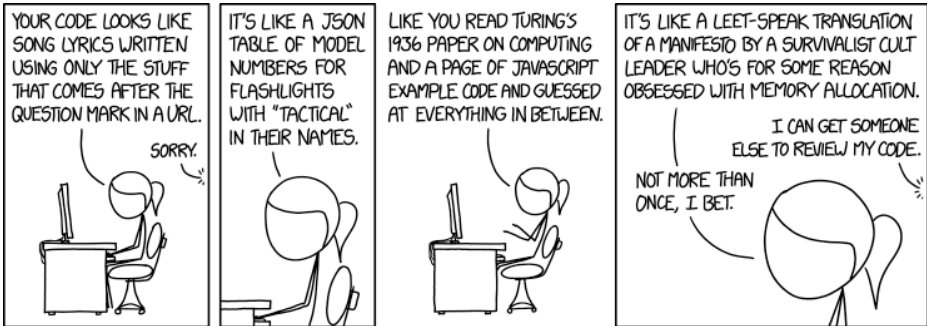
The comic is split into 6 sectors as described below:

As Randall goes through more photos, he finds more bad ones, erases them and more storage becomes available. This allows taking more photos and still don't exceed the limits of the quota. This is why the "secondary" lines (e.g between the different storage types) are not completely vertical but tilted to the right at the top.

The title text states "A good lifehack is to use messy and unstable systems to organize your photos. That way, every five years or so it becomes obsolete and/or collapses, and you have to open it up and pick only your favorite pictures to salvage." If you know that you will lose everything, that knowledge will encourage you to save what you want the most and leave everything else. It will also help decrease how many photos you have through the same awareness.

#1833: Code Quality 3

May 05, 2017



It's like a half-solved cryptogram where the solution is a piece of **FORTH** code written by someone who doesn't know **FORTH**.

Explanation

This comic is the third in the Code Quality series:

- 1513: Code Quality
- 1695: Code Quality 2
- 1833: Code Quality 3
- 1926: Bad Code
- 2138: Wanna See the Code?

In the first panel, Ponytail references query strings, which store information, such as search queries or page numbers, relevant to the URL. Query strings are often not meant to be especially human-readable (eg. "&sxsrf=APq-WBvn82l8oTeNNzZeCkI7B9nM5nxoVg%3A1647235405067"), so a song based on one would likely not be a good one.[citation needed]

A tactical flashlight is a light that can be mounted on a gun for use in low-light scenarios. (Some stores in online marketplaces may also call their flashlights "tactical" just to make them sound higher quality). They tend to be very durable and very bright. Different models have different features and capabilities, so they are given cool-sounding model numbers. JSON (JavaScript Object Notation) is a subset of JavaScript used, by many programming languages, as a convenient way of recording structured data. It's not clear what else would be in the table (tables typically have more than one column) and JSON technically has arrays and objects

(dictionaries) but not tables, but a JSON array of objects of these model numbers would look something like:

Alan Turing was a British theoretical computer scientist, often considered the father of the field. His 1936 paper outlined Turing machines, a theoretical model for computing, as well as computability and the halting problem. Theoretical computer science is very different from practical coding; understanding the contents of the paper would not at all help a coder to understand today's algorithms, design patterns, and best practices. This is not helped by a page of JavaScript example code. JavaScript is a popular programming language which makes web pages responsive to user inputs, and while JavaScript arguably solves the problem in a practical manner (as opposed to Turing's very theoretical work), it does get a lot of criticism - for instance it is nearly untyped, which allows the programmer to do very interesting things, like JSFuck. Then, example code is used to explain a concept in programming or demonstrate how a program works, but it does not actually run on any computer. "Guessing everything in between" would involve attempting to write code using skills that could range anywhere from the most basic programming to Turing's extremely advanced ideas.

In the final panel, Ponytail references leet-speak, in which symbols are replaced with similar-looking symbols, and a manifesto, a statement of a person or group's beliefs and intentions. A manifesto from a survivalist cult leader might be nonsensical, even before being translated to leet-speak. Memory allocation is a

low-level computer programming concept; most modern languages have features that take care of memory allocation for the programmer, possibly implying that Cueball does not know how to use these features.

At this point Cueball, quickly becoming impatient with Ponytail's sass in what is supposed to be a formal code review, retorts that if she can't start giving him the constructive criticism that he's looking for, he can always find someone else to replace her. Ponytail smugly responds that nobody else would be able to stomach his code for more than one sitting, and that she's the only one he's got.

Forth is an old programming language that tends to be difficult to read. It is stack-based, meaning that values to be operated on are moved on a stack before the operation to be performed is given. Using stacks can be considered different from programming languages that resemble natural human language (e.g. COBOL). While stack-based computing makes some problems very simple (for example, it is relatively simple to design a Forth compiler, or reversing the order of an array) and uses less computing resources, such programming languages are not easy to learn. Since Forth allows the programmer to rewrite the language, or define their own language, and it does not enforce restrictions like data types, it may be especially easy for novices to write cryptic code.

A cryptogram is a cipher puzzle, generally one easy enough to be solved manually. The title text implies that the code is so bad that it looks like unreadable Forth code

that is missing random characters.

#1834: Lunch Order

May 08, 2017



EVERYONE COMPLAINS ABOUT AUTOCORRECT,
BUT WE FORGET ABOUT THE TIME IT
PREVENTED A NUCLEAR WAR.

GO FOR LUNCH, REPEAT, GO FOR LUNCH.

Explanation

The comic plays on the similarity of the words "launch" and "lunch," and the fact that both "Lunch order" and "Launch order" are common phrases in their respective environments. A "lunch order" is common in many work places, where a person may be asked to go pick up lunches for multiple coworkers so they don't all need to leave to get their lunches -- they would typically give their lunch order to the person making the run so they would know what to order. A "launch order" would only apply to a place capable of launching missiles, such as military installation housing launch-able missiles. So while a "lunch order" is pretty benign and could certainly apply to such a place, a "launch order" of a nuclear warhead is a much more drastic command, meaning that the principle of deterrence has failed and mutually assured destruction is imminent. By receiving an order for "lunch" instead of to "launch," nuclear war was avoided.

Autocorrect is a feature in many software text-entry applications (such as smartphone "keyboards") that will make changes to entered text that it identifies as misspelled in order to quickly increase legibility of the final text. While this process typically makes text entry quicker and easier for users, sometimes the automatically corrected text will not match what the user intended to send, which can lead to miscommunication.

In most circumstances, military units charged with the maintenance of active nuclear weapons will receive their

orders to employ those weapons based on direct communication from a commanding authority, these forces in the United States are commanded by the United States Strategic Command. The majority of modern nuclear weapons are prepared to be deployed by rocket launch.

The joke does not depict an actual historic event. To our knowledge, the last time the United States almost launched nuclear missiles at a hostile power was June 1980, while the function we know today as Autocorrect would not enter development until the 1990's. That said, the country still maintains a large nuclear arsenal ready to launch on short notice. The comic might be playing off recent fears involving hostilities between the United States and North Korea; if any l(a)unch preparations have been taken in 2017, they were not declassified by the time this comic was published.

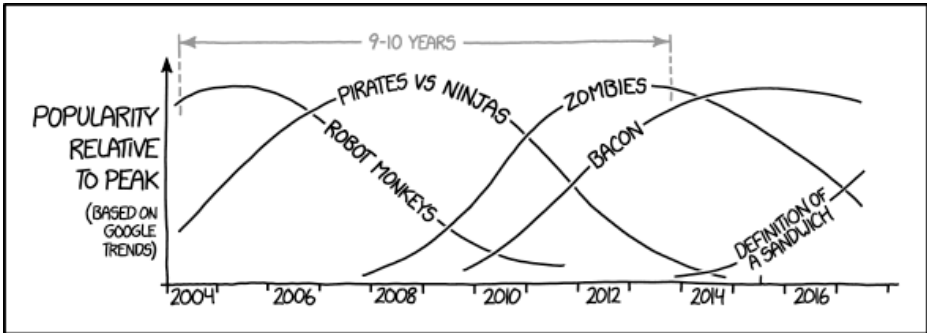
The title text plays on the similarity between two phrases: "GO FOR LAUNCH" is the standard way to express the Launch status check for a rocket (and means that all checks have passed and launch can proceed), whereas "GO FOR LUNCH" expresses the more mundane act of simply beginning one's lunch break. Despite the repetition (which is intended to reduce the chance of a miscommunication), the autocorrect still managed to distort the message a further two times.

A previous comic also explain the 898: Chain of Command and who's responsible of the red button. Missile launch systems and inaccurate alteration of text

also figure in the later comic 2099: Missal of Silos.

#1835: Random Obsessions

May 10, 2017



JUDGING FROM GOOGLE TRENDS, THESE RANDOM SEMI-IRONIC OBSESSIONS SEEM TO LAST ABOUT NINE OR TEN YEARS, SO WE SHOULD BE DONE WITH THE SANDWICH THING BY 2024.

I take the view that "open-faced sandwiches" are not sandwiches, but all other physical objects are.

Explanation

This comic is formatted as a graph showing various Internet trends over the years according to Google Trends. The caption states that these "random obsessions," as stated in the title, have 9-10 year cycles, and so predicts that the sandwich debate will be over by around 2024. As of June 2024, the sandwich debate is still not really going away and doesn't seem to be any time soon. For example, search trends for "is a hot dog a sandwich" did in fact start rising around 2014, to a peak roughly around 2018, but appear to have maintained more or less their 2018 levels since. Searches for "is a taco a sandwich" started rising in 2016 and appear to have roughly risen consistently since then.

Discussions about the definition of "sandwich" are surprisingly common on the web, such as "Is hot dog a sandwich?" (See this discussion on Reddit)

The title text is a joke based on the debate over the definition of a sandwich. The speaker, presumably Randall, starts out with the fairly reasonable stance that open-faced sandwiches are not true sandwiches, but then veers off into the absurd by claiming that literally every other physical object in the universe is a sandwich. We can only hope that Randall does not extend this view to human beings. (On the other hand, Randall may simply be defining a sandwich in an unusual way without implying that all other items are edible, or that all objects "sandwiched" between two of the same thing (such as air,

vacuum, laptops, or slices of bread) constitute a "sandwiched item" which is not necessarily edible. Such strange definitions have been seen before, in the title text of 1405: Meteor.)

The other obsessions mentioned are, in order: robot monkeys, pirates vs ninjas, zombies, and bacon.

"Robot Monkeys" likely refers to people being obsessed with a movie or robots of some kind. It may specifically refer to the American/Japanese animated TV series, Super Robot Monkey Team Hyperforce Go!, which aired from September 18, 2004 to December 16, 2006. It is possible that, based on this, that the trend curve does not actually begin in 2001, but does actually begin in 2004 as shown.

"Pirates vs Ninjas" refers to a longstanding internet meme, popular in roughly the years shown on the chart, that held that ninjas and Caribbean pirates were arch-enemies.

"Zombies" refers to the recent occurrence of zombie themed television shows (The Walking Dead) and movies (World War Z etc).

Though the trend is dying out, as seen by the fact the graph is past the peak, there has been an explosion in bacon flavored/scented products as well as items of clothing and decor that look like bacon. The YouTube channel Epic Meal Time was also part of the bacon fad, as adding large quantities of bacon to the meal being

prepared was one of the running gags of the channel.

#1836: Okeanos

May 12, 2017



I LOVE WATCHING THE OKEANOS OCEAN EXPLORATION LIVESTREAM,
BUT IT'S PROBABLY FOR THE BEST THAT THEY DON'T ENABLE CHAT.

WHEN I WAS ON A BOAT I DROPPED MY PHONE CAN U LOOK
FOR IT

Explanation

The NOAA's Okeanos Explorer, named after the Greek (and Roman) personification of the sea Okeanos, is a vessel that is currently exploring the Central Pacific Basin. It livestreams the video feed of its deep sea exploration online.

This comic seems to be a representation of the livestream on YouTube ; see the table below for details.

The chat section for the actual livestream is disabled, but the comic adds some humorous examples of what the chat section would look like. Several of the examples are the product of commenters falsely believing the livestream is that of a game, probably since most livestreams on YouTube are of people playing games; Randall is joking about the viewers of said streams in particular not being able to tell the difference, as well as YouTube commenters in general. Randall has mentioned the ridiculousness of comments on YouTube before in both 202: YouTube and 481: Listen to Yourself. One of the comments seems to refer to Minecraft or a similar game, since one of the comments asks why nothing is being crafted (crafting is a mechanic in many games, used to make items).

In the caption below Randall states that he likes to view the stream and commends them on disabling the chat section, for the reasons given in the comic above.

The title text is yet another comment by someone who dropped their phone from a boat, and now wants to use Okeanos' resources to find it, which is of course impossible; if the boat was anywhere near Okeanos, the phone would have swiftly been hidden in the silt on the bottom. And even if not, the chance of finding anything dropped in the Pacific Ocean, the largest Ocean on the Earth, is all but zero. Also, the Central Pacific Basin, where Okeanos was at the time of this comic's release, is 6500 meters deep; at that depth the water pressure is approximately 4454.863 kilopascals, or roughly 646 PSI. This is probably enough to irrevocably damage something as breakable as a cell phone. Even if the phone were of the so-called "waterproof" variety, that rating is usually only applicable to a few meters of depth rather than thousands of meters. Needless to say, retrieving one's phone from the bottom of the Central Pacific Basin would be a challenging and pointless endeavor.

#1837: Rental Car

May 15, 2017



Technically, both cars are haunted, but the murder ghosts can't stand listening to the broken GPS for more than a few minutes.

Explanation

In this comic the couple Megan and Cueball want to rent a car. The Cueball-like guy from the car rental agency tells them they only have two vehicles available:

- One car that puts its occupants into mortal danger, so much such that it is called The Murder Car. The danger, however, is abstract—the car is haunted by a ghost, and actual death befalls only "maybe one in six". (That is the equivalent of a round of Russian Roulette.) This is the fatality rate for drivers (in this case, Megan), while the rate for passengers is not mentioned.
- The other car, a regular sedan, has a defective GPS that incessantly gives instructions to go specifically to Seattle, regardless of the driver's intention to go there, and it cannot be turned off.

Megan believes she can ignore this and accepts the less lethal car. The comic suggests that driving with a GPS that tries to guide you to a different destination than that which you wish to visit—so it is always recalculating and asking you to do U-turns—is incredibly annoying. So annoying that given the choice between the persistent low-level annoyance of the GPS on one hand, and the ("low") probability of being murdered on the other, most people will choose the latter option. After all, they might survive murderous ghosts but they feel they will not survive long having to listen to the broken GPS.

According to the title text, the murderous ghosts haunt

both cars, but as soon as the car starts driving and the GPS begins to drone on, even the ghost cannot stand listening to the broken GPS and stops possessing it.

Apart from the joke about GPS, this is also a subtle joke on the horrible cars one might get at a car rental service.

It is also possible that the car rental service is trying to drive people away from the haunted car, which we can assume is just a normal car, to get more profit when people come back and take the "haunted" car when their GPS is broken.

#1838: Machine Learning

May 17, 2017



The pile gets soaked with data and starts to get mushy over time, so it's technically recurrent.

Explanation

Machine learning is a method employed in automation of complex tasks. It usually involves creation of algorithms that deal with statistical analysis of data and pattern recognition to generate output. The validity/accuracy of the output can be used to give feedback to make changes to the system, usually making future results statistically better.

Cueball stands next to what looks like a pile of garbage (or compost), with a Cueball-like friend standing atop it. The pile has a funnel (labelled "data") at one end and a box labelled "answers" at the other. Here and there mathematical matrices stick out of the pile. As the friend explains to the incredulous Cueball, data enters through the funnel, undergoes an incomprehensible process of linear algebra, and comes out as answers. The friend appears to be a functional part of this system himself, as he stands atop the pile stirring it with a paddle. His machine learning system is probably very inefficient, as he is integral to both the mechanical part (repeated stirring) and the learning part (making the answers look "right").

The main joke is that, despite this description being too vague and giving no intuition or details into the system, it is close to the level of understanding most machine learning experts have of the many techniques in machine learning. 'Machine learning' algorithms that can be reasonably described as pouring data into linear algebra

and stirring until the output looks right include support vector machines, linear regressors, logistic regressors, and neural networks. Major recent advances in machine learning often amount to 'stacking' the linear algebra up differently, or varying stirring techniques for the compost.

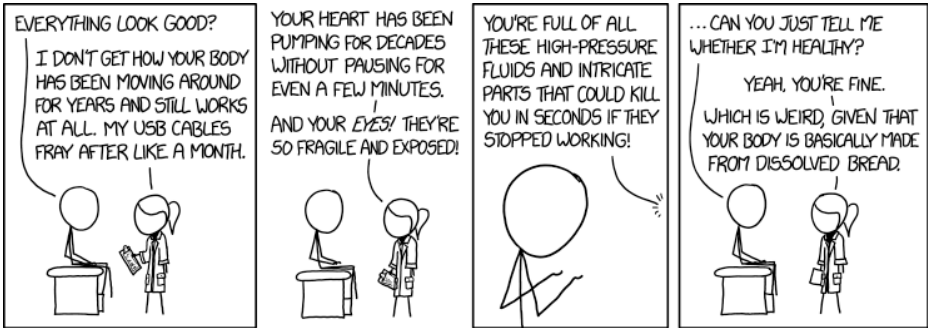
This comic compares a machine learning system to a compost pile. Composting is the process of taking organic matter, such as food and yard waste, and allowing it to decompose into a form that serves as fertilizer. A common method of composting is to mound the organic matter in a pile with a certain amount of moisture, then "stirring" the pile occasionally to move the less-decomposed material from the top to the interior of the pile, where it will decompose faster.

In large-scale composting operations, the raw organic matter added to the pile is referred to as "input". This cartoon implies a play on the term "input", comparing a compost input to a data input.

A recurrent neural network is a neural network where the nodes affect one another in cycles, creating feedback loops in the network that allow it to change over time. To put it another way, the neural network has 'state', with the results of previous inputs affecting how each successive input is processed. In the title text, Randall is saying that the machine learning system is technically recurrent because it "changes" (i.e. gets mushy) over time.

#1839: Doctor Visit

May 19, 2017



According to these blood tests, you're like **30% cereal**.

Explanation

Cueball is visiting his doctor Ponytail, apparently for a general medical checkup.

While there is nothing wrong with him medically, the doctor wonders why he has continued to work for many years despite his body parts' individual fragility. Compared to man-made structures - like the USB cables mentioned by Ponytail, which quickly begin to fray - it's surprising that the body can survive for so long while sustaining so much wear and tear. Actually the body gets stronger and more fit the more it is used (an example of antifragility), in contrast to USB cables, which tend to wear out with use.

Ponytail specifically mentions his eyes which are so fragile and exposed. Of course they have to be "exposed" to receive light - yet most people go through their whole life with both eyes intact, although vision itself may become impaired. The shape of the skull around the eyes, as well as human reflexes, have a lot to do with the fact that it is possible to protect such fragile structures for a lifetime.

Ponytail also remarks that the body is composed of high pressure fluids (particularly blood, intracellular and extracellular fluids) and intricate parts (like the nervous system and circulatory system). If the fluids stopped flowing or the intricate parts stopped working, the entire body would fail, killing Cueball.

It should be noted that the human body is constantly replacing dead/injured cells and proteins. In a young human body, everything in the body is continually refurbished, and nothing is able to become old enough to deteriorate unintentionally; this requires a constant supply of energy and nutrients to keep this process going. As the body ages, these self-repair mechanisms eventually slow and can no longer keep up with the required repairs; this manifests as the various symptoms of old age (wrinkled skin, graying and balding hair, worsening eyesight and hearing, etc.) and eventual death.

USB cables are built to withstand far more wear and tear than the human body. But while this makes them tougher than blood vessels on the outset, they inevitably fray and fail faster than blood vessels because they lack the self-repair mechanisms of organic material.

The doctor's final remark is that Cueball is mainly made from dissolved bread, which is true from the perspective that the food (bread) he eats is digested in his alimentary system, absorbed into his bloodstream and used as nutrients for growth and repair. Paleontologists use a method called isotopic analysis to determine the diets of ancient people from elements preserved in teeth and bones. Ponytail could have ordered a similar test on Cueball.

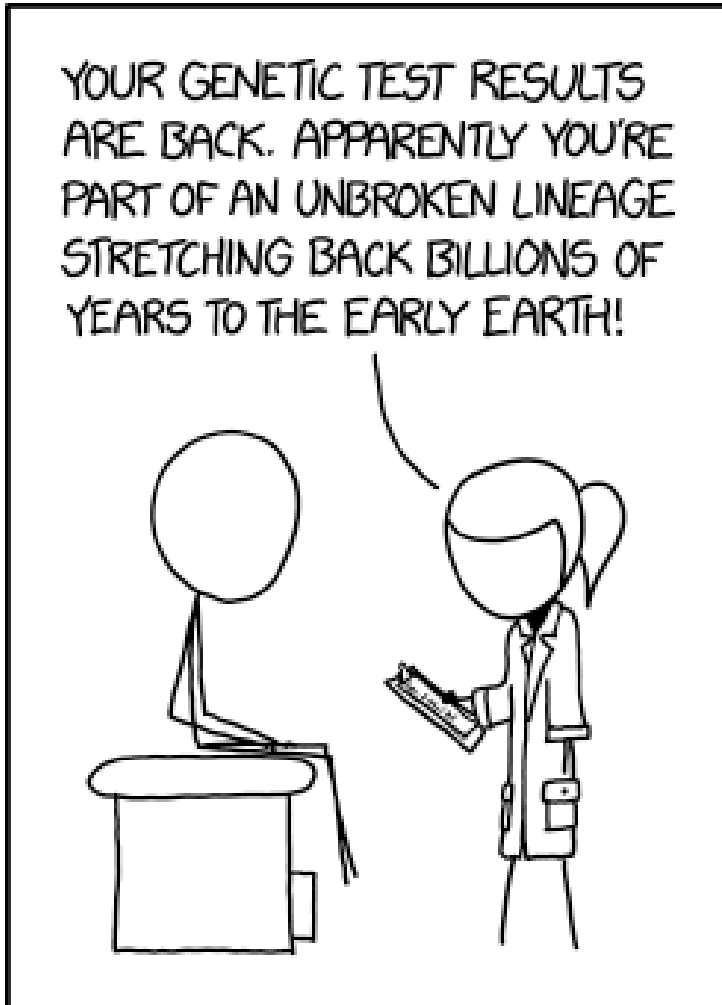
This is taken further in the title text, where she states that the blood tests reveal he is 30% breakfast cereal. This likely comes from the widely-cited but not entirely accurate factoid that the human body is 70% water. The

other 30% would then be flesh and other organic matter, or the dissolved bread the doctor described. Breakfast cereal and bread are both products of cereal, the edible part of a grain, making the comparison apt.

All things taken into consideration, we don't actually have any confirmation that Ponytail is a real doctor. As Randall has stated before, anybody can just buy a lab coat. Although Ponytail's answer in the final panel lacks the usual "I have no idea" or equivalent non-answer, it's still somewhat possible she's a real doctor having an existential episode.

#1840: Genetic Testing Results

May 22, 2017



That's very exciting! The bad news is that it's a risk factor for a lot of things.

Explanation

Ponytail continues Cueball's medical checkup with a genetic test. Genetic tests show people genetic diseases that they might be at risk for and/or give them insight into their ancestry. In this case, the genetic results are extremely obvious: His genes are part of a long line of genes stretching back to some of the earliest life forms to have genes. This information is universally true - every known organism has such a genetic history - which makes it so vague as to be useless for either medicine or ancestry.

In epidemiology, a risk factor is a variable associated with an increased risk of disease or infection. The title text says that this is a risk factor because being a living organism is, trivially, associated with every disease that exists.

#1841: Who?

May 24, 2017



Gonna feel even dumber when I realize that all this time he's been talking into a bluetooth thingy and we're not actually friends.

Explanation

Cueball and Hairy are walking while Hairy is talking about going to a wedding by sharing a ride. He names three people: the groom; a friend with whom he's sharing the ride; and another person he hopes to meet on the way, perhaps another guest at the wedding. The ellipsis at the beginning indicates he's been talking beforehand, and Cueball has listened to all of it.

Cueball at first replies with an "it's cool" sentence, apparently expressing interest, satisfaction or approval at the idea of Hairy meeting the people he mentioned. This usually happens when two people are talking about something they have in common, like meeting with friends at a social gathering.

However, Cueball suddenly expresses that he's been lying about knowing them, and he doesn't have any intentions of preserving such lie. Note that he didn't need to explicitly acknowledge to be those people's acquaintance, he might just have nodded or said expressions like "it's cool".

Part of a social need for inclusion, or as a way to continue a conversation, people sometimes agree with the person they are talking to, or feign knowledge of the people, things or topics that were mentioned.

The title text suddenly changes the situation by stating that it's possible Hairy has been talking to someone else using a Bluetooth earphone set. This hands-free device is

used to communicate via phone call and is small in nature and only visible from one side of the face, so anyone who comes across someone using this device can at first wonder whether they're actually talking to them, because no phone can be seen. This situation could mean that Cueball has been hearing and / or talking to this person, who might not even be his acquaintance, given that he knows people that Cueball doesn't seem to know about, and that he might not actually be his friend. This is a hilarious exaggeration of people with some attention problems.

The title text is an allusion to 476: One-Sided, where Randall doesn't realize who the other person is talking to.

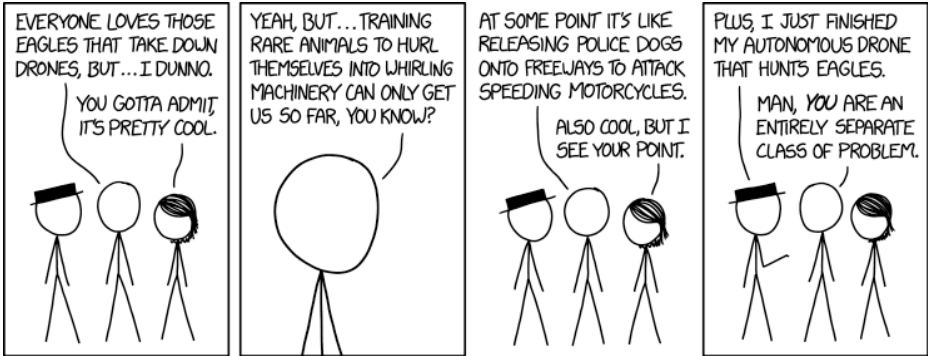
In 302: Names Cueball also has difficulty with names.

The problems with bluetooth headsets' inconspicuousness is a key point in 736: Cemetery.

Another example of not knowing someone is talking on the phone:

#1842: Anti-Drone Eagles

May 26, 2017



It's cool, it's totally ethical--they're all programmed to hunt whichever bird of prey is most numerous at the moment, so they leave the endangered ones alone until near the end.

Explanation

Law enforcement and security agencies may use birds of prey to combat drones flying unlawfully over restricted sites. This could be more cost effective than using technological means (such as scramblers and counter-drones) and safer for the public than using conventional weaponry (such as shotguns). Results of this strategy have varied.

Eagles, being predators, have natural tendencies to attack the central components of drones while avoiding the sharp and spinny bits.

Cueball argues that this is unethical as it forces rare animals to put their lives at risk, and compares it to using police dogs for traffic control, which people would generally frown upon.

Effectiveness depends upon the conditions of use. Obviously eagles can't be used everywhere that drones are restricted, but they are often effectively used where ground security is also present to identify and arrest those that might be unlawfully flying the drones, so they can't indefinitely replenish their hardware. The first paragraph has links to real life examples. Not only would it be unethical, but also ineffective. The supply of Eagles is rather limited, and there are biological limits to how fast it can be replenished, whereas more drones can be created very quickly to replace those that are destroyed. Traffic control dogs would be similarly ineffective, as dogs

would struggle to run as fast as a speeding motorcycle, and would be powerless to stop the motorcycle even if they could.

Megan thinks both ideas (eagles and dogs) sound cool, but she understands the ethical argument against using them for traffic control.

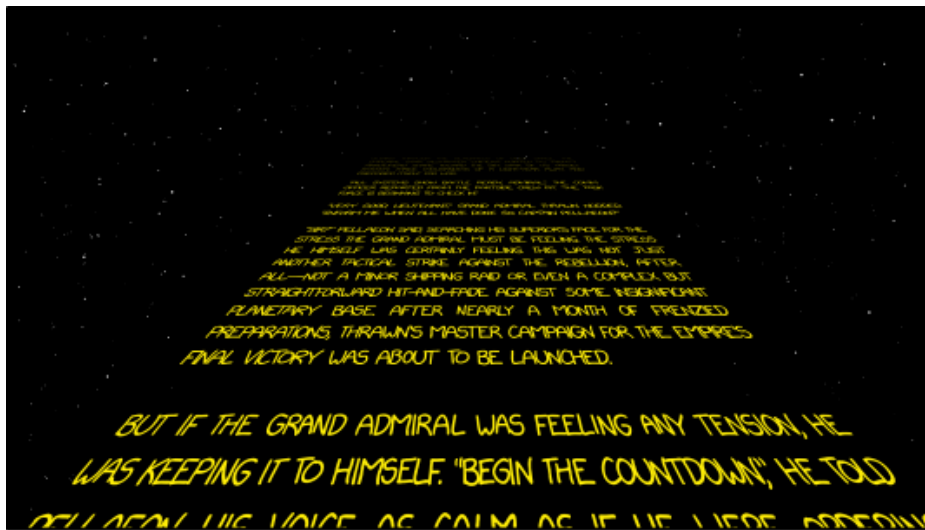
Black Hat, on the other hand, goes a step further and says that he has created a drone that hunts the eagles, flipping the premise from “anti-drone eagles” to “anti-eagle drones”. In the title text, he continues that is ethical because they (only the title text mentions that there are several of such drones) only target the most populous species first, although they will eventually eradicate the endangered ones once they bring down the number of all birds of prey (note that this implies that he wants to make all birds of prey extinct or endangered). He seems to miss the point that it is not merely the relative number of birds that creates the ethical problem, but the fact that animals’ lives are being put at direct risk by humans. His construction of the anti-eagle drone may be simply for the point of making the eagles’ goals not only dangerous, but also entirely ineffective. This is probably not an opposition to privacy but merely his trademark classholery in action.

Nevertheless, in the title text, Black Hat raises a crucial point in ecology: There are generalist and specialist predators (as well as herbivores). A specialist hunts or eats only one species (e.g. the koala eats only eucalyptus), while a generalist (think crows) hunts or eats the most

available food. Thus, a generalist often spares species that have become rare due to overhunting, disease or famine. A generalist predator (or herbivore) thus manages the wildlife, and a healthy population of generalists is almost always beneficial. Now, if Black Hat creates a drone that hunts the most available species, he gets the right idea (a food generalist manages wildlife), but gets the other one seriously wrong: Eagles are already doing their job as generalists, and as predatory birds are not so abundant, a generalist that feeds on predatory birds would need to have a very large territory. And as drones cannot reproduce yet and do not need to hunt as an energy source, releasing a drone to fulfil an ecological role would not make any sense. How does the drone know it has hunted enough eagles? Does the eagle-hunting drone feel hunger and decide to hunt elsewhere after reducing the number of local eagles, or does it just hibernate?

#1843: Opening Crawl

May 29, 2017



MOVIE THEATER PROJECTION BOOTH PRANK: SEE HOW MANY PAGES OF A STAR WARS NOVEL YOU CAN GET PEOPLE TO READ BEFORE THEY FIGURE OUT THERE'S NO MOVIE COMING AFTER IT.

Using a classic Timothy Zahn EU/Legends novel is bad enough, but at least the style and setting aren't too far off. If you really want to mess with people, try using *Splinter of the Mind's Eye*.

Explanation

Each episodic Star Wars film begins with an "opening crawl" giving the audience some of the backstory, which often reads like the prologue of a novel.

Randall wants to reverse this by projecting the text of a Star Wars novel and see how long this can be continued before viewers realize it is a prank. The text in the opening scroll is actually from the beginning of the final book of the Thrawn Trilogy by Timothy Zahn.

The title text compares different Star Wars novels' style, remarking on how well suited they would be for this prank.

Timothy Zahn is a science fiction writer who has written and contributed to many novels and comics in the Star Wars expanded universe. The text in the comic is the first five paragraphs from the book *The Last Command*. The characters mentioned are Grand Admiral Thrawn, the primary antagonist of the Thrawn Trilogy, and Gilad Pellaeon, who serves as a Dr. Watson-type companion to Thrawn throughout much of the trilogy.

Splinter of the Mind's Eye was an early Star Wars novel written before the original film was expanded to a trilogy (and then expanded some more), so it contains multiple aborted subplots which can make it very confusing for a fan who has seen the later works.

The term "EU" refers to "Expanded Universe", which was

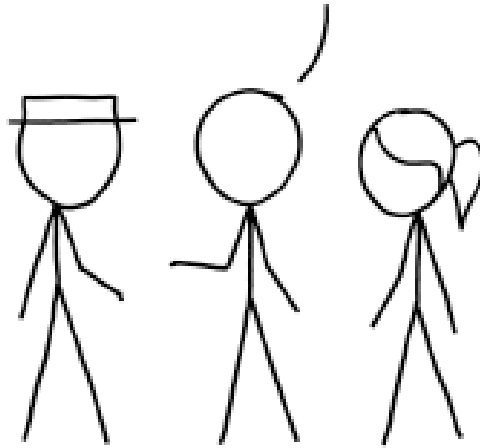
the term for the corpus of non-cinematic Star Wars content before Star Wars was acquired by Disney. Not wanting to be constrained by previous canon, Disney declared all "Expanded Universe" content to be non-canonical to all future movies, and re-branded the EU as "Legends" to take place in its own alternate continuity.

For a very long time, fans believed that the Thrawn Trilogy would have constituted Star Wars VII to IX should the movie have been made and thus "before they figure out there's no movie coming after it" refers to both the mistaken belief of fans and the novelization as delivered through the opening crawl.

#1844: Voting Systems

May 31, 2017

I PREFER APPROVAL VOTING, BUT
IF WE'RE SERIOUSLY CONSIDERING
INSTANT RUNOFF, THEN I'LL ARGUE
FOR A CONDORCET METHOD INSTEAD.



STRONG ARROW'S THEOREM: THE PEOPLE
WHO FIND ARROW'S THEOREM SIGNIFICANT
WILL NEVER AGREE ON ANYTHING ANYWAY.

Kenneth Arrow hated me because the ordering of my preferences changes based on which voting systems have what level of support. But it tells me a lot about the people I'm going to be voting with!

Explanation

This comic is about types of single-winner voting systems:

Arrow's impossibility theorem gives a list of criteria for ranked voting systems and states that no system can satisfy all of them at once, despite that for each of them it may seem "obvious" that an electoral system ought to satisfy it. Some voting theorists (such as Cueball) dislike IRV because it fails more of the criteria than Condorcet does.

The primary joke in the comic is the premise that people who are pedantic or knowledgeable enough to find Arrow's theorem to be relevant will self-fulfill the theorem by being inclined to disagree on any effort to change the voting system. This is illustrated by Cueball's voting system preference that is contingent on the preferences of other people, which defeats their effort to produce a community-wide ranking.

A secondary joke in the comic is that often voters don't pick their favorite choice in a vote. Instead, they vote for a less favorable, but more likely electable, person as a way to prevent their least favorite choice from being elected. This is commonly called "spoiler effect"; in Arrow's parlance it is a form of IIA criterion failure. Cueball's strategic vote switch implies that they may be using FPTP (which they dislike) to make the decision, as FPTP is the only system to involve a potential "spoiler effect"

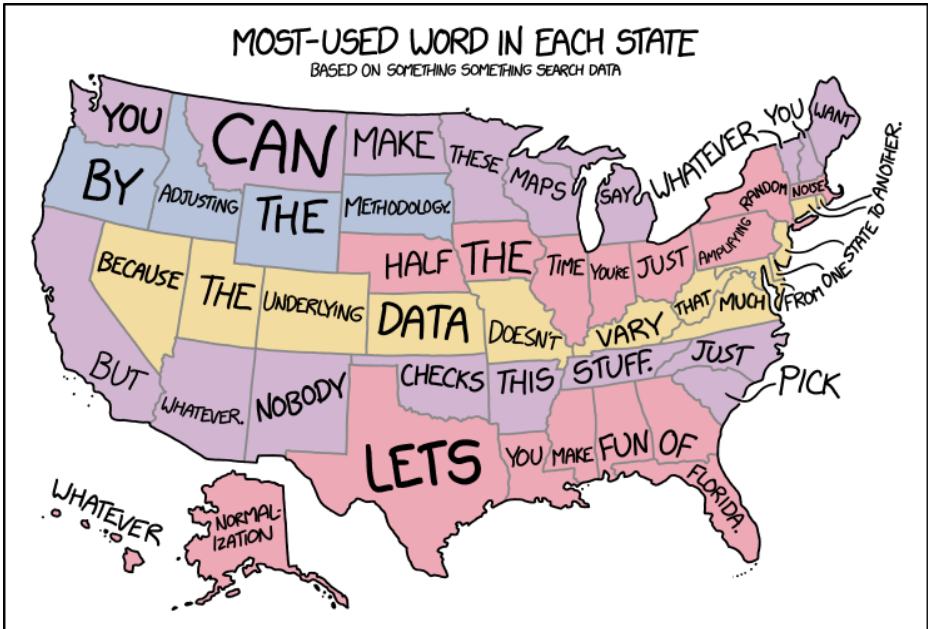
(note, however, that certain vote distributions in systems such as IRV can produce a similarly problematic and illogical effect on the outcome).

A third joke is the recursive self-referencing inherent in voting to choose a voting system.

The title text stipulates that Cueball has no fixed ranking of preference for human candidates, but makes this choice dependent on which voting system is favored by the group. This exceeds strategic voting considerations as the ranking should have full information, whom Cueball prefers in each situation. Therefore Arrow's impossibility theorem and the analysis behind it assume the ranked preferences of an individual voter as a fixed given. To make them dependent on the voting system makes assessing the efficacy of the voting systems absurd or at least much more complicated to do as a general assessment. That is given as the reason why Arrow would wholeheartedly hate him.

#1845: State Word Map

June 02, 2017



The top search for every state is **PORN**, except Florida, where it's **SEX PORN**.

Explanation

This is another of the many comics where Randall used a map of the United States for his joke (see below for examples). Similar in spirit to 1138: Heatmap, this comic pokes fun at many maps that attempt to use data to discern unique characteristics about various sub-regions, in this case American states. This map may have been inspired by this map posted on Twitter by Google Trends the day before the comic was posted. Many web companies use maps like this in viral marketing, but the methodology behind them is pretty weak. The random noise in the data will mean that there will be variations between states even if there is no underlying pattern - and this can be further boosted by statistical tricks. A common one is to show the "most characteristic" or "most distinctive" term for each state. For instance, the most common cause of death is heart disease or cancer in every US state, but this makes for a boring map. Looking at the most distinctive cause of death produces a more interesting map, but it highlights very minor trends - Louisiana is marked as having syphilis as its most distinctive cause of death, even though only 15 Louisianans in every 100,000 have the disease and there were only 22 syphilis deaths in the state over a whole decade. These maps can give a misleading impression of huge variation between states that doesn't really exist.

This map does not include real data, but says (when read left to right):

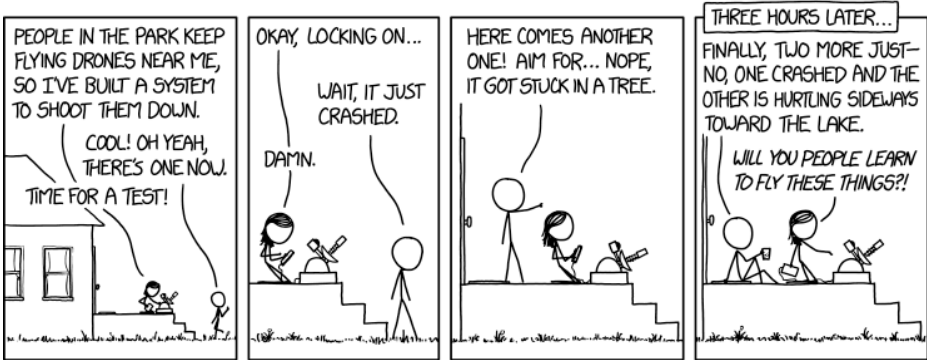
The primary joke is that the likelihood of these being the words used most often by the inhabitants of each state is low, rather than accurately representing the most used words Randall has just done exactly what he says he can do (make fun of Florida by putting whatever he wants). He also has not obtained the data from anywhere, just 'Something Something'. The joke about Florida is that the most used word in Florida is "Florida", which would make people in Florida very self-centered.

The comic continues to make fun of Florida in the title text by saying that Florida searches for "sex porn" instead of "porn", which is not needed since porn already means the depiction of sexual content. This is also probably a reference to Pornhub's data-farming exercises, where they have periodically released the most frequently searched term by state. Florida is often the butt of many jokes, including the Florida Man meme and many mocking jibes regarding its messy electoral history. For more information on why Florida itself seems eager to play into this stereotype, check out the "Only in Florida" phenomenon.

Randall previously used a map of the United States as the basis for his comics in 1767: US State Names, 1653: United States Map, 1509: Scenery Cheat Sheet and in 1079: United Shapes.

#1846: Drone Problems

June 05, 2017



On the other hand, as far as they know, my system is working perfectly.

Explanation

Megan is frustrated because people are flying drones too close to her, so she builds a system to shoot them down. She shows it to Cueball, who is also excited about the idea and helps spot the drones. However, each of the drones gets accidentally destroyed by its pilot because of their inability to fly the drones before Megan can destroy them herself.

After three hours of unsuccessful drone hunting, a frustrated Megan complains about people unable to fly the drones, which prevents her (and Cueball) from having fun shooting them down. The joke is that she created the system to get rid of the drones, so the lack of drones should be the desired output - and now she wants the drones nearby (even if only temporarily).

This comic is a follow up on 1842: Anti-Drone Eagles, and confirms that Cueball prefers technological air-defense systems to biological measures.

The title text refers to the fact that from the pilots' perspective, the system is successful at keeping all the drones away from the house, even though in reality the system has not had a chance to be successful yet.

While Megan attributes the repeated drone crashes to poor pilot skill, a possible source for the drones' sudden loss of control is hinted at in panel two, in which the target drone crashes immediately after Megan's device (equipped with a miniature parabolic dish) attempts to

"lock on" to the drone in question. While a small and fast-moving drone may be difficult to hit, the control system that directs its movements is easily interfered with (either by overwhelming the RF signal controlling it or by using microwaves to induce short circuits in sensitive electronics). The irony here is that the targeting system for Megan's anti-drone device unintentionally appears to be more effective than the actual weapon it is designed to guide, disabling the drones so quickly that the "real" weapon is unable to be tested.

It may also be a reference to the May 30, 2017 FTG-15 test of the United States GMD missile defense system, where an interceptor kill vehicle destroyed a test ICBM. From the perspective of a US adversary, such as North Korea (whose missiles the system is allegedly targeted at), "as far as they know, the system is working perfectly," as the test was declared to be a success. But substantial controversy has dogged the missile defense system for decades, as critics have alleged it is vulnerable to trivial countermeasures. But "as far as they know" strongly implies that the text following it is not true, i.e. the system does not work perfectly.

Another possible secondary joke is that the drones were flying near her because the pilots can't fly properly. Yet another possible take on the joke is that Megan's system is actually effective, but Megan is not aware it's been activated.

Megan had previously suggested in 1586: Keyboard Problems, that robots (and thus also drones) getting near

Cueball's house (and possibly Cueball's general vicinity) would unexpectedly crash.

Megan previously had a laser cannon to shoot down squirrels in 382: Trebuchet, so this is not the first time she has built a device for shooting things down.

#1847: Dubious Study

June 07, 2017



IF SOMETHING IS FORMATTED LIKE A
SERIOUS SCIENTIFIC PAPER, IT CAN TAKE
ME A WHILE TO REALIZE IT ISN'T ONE.

Sounds fine. I looked up the Academy, and it says on their MySpace page that their journal is peer-viewed and downloaded biannually.

Explanation

This comic alludes to the growing industry in disreputable academic journals, many of whom accept articles of dubious merit for publication without rigorous peer review upon payment of a fee. In an attempt to sound legitimate (and thus attract submissions), many such publishers publish journals whose names sound intentionally similar to (if not identical to) established titles. Here, the National Academy of Proceedings is a meaningless title that sounds similar to the highly regarded academic title Proceedings of the National Academy of Sciences, USA.

The title text implies that this (at present) fictional journal has a dubious online presence in the faded internet site MySpace, where the publishers make claims that may be true but are misleading: "peer-viewed" sounds similar to "peer-reviewed", the community-led process of establishing a paper's scientific integrity prior to publication, but in fact means only that scientists have viewed the content (as Cueball is now). Likewise, some journals might be "published biannually", whereas "downloaded biannually" implies that the journal is read only twice each year. Single articles in high-profile journals such as Proceedings of the National Academy of Sciences would expect to receive hundreds to thousands of views in their first year of publication. The fictional journal publisher no doubt hopes that an inexperienced scientist may mistake these claims for meaningful statements of authority, and thus submit a paper (and

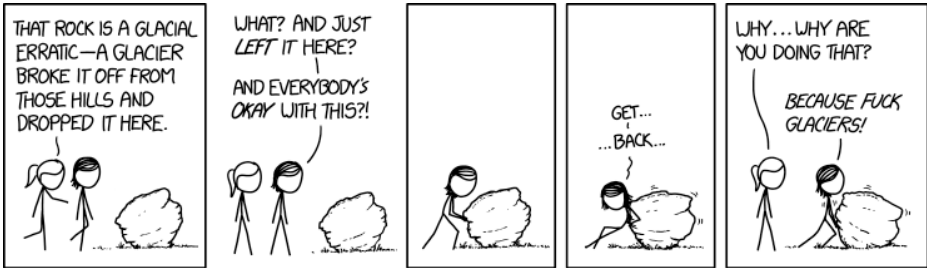
eventually pay a fee for its publication).

The National Academy of Proceedings in fact sets itself apart from certain predatory journals by ensuring that the claims on its website are in fact factually accurate (if phrased to mislead article authors, particularly those with English as an additional language); some journals are openly dishonest on their websites.

Randall also judges academic content based on superficial details in comic 1301: File Extensions, where he focuses on how the information is formatted (in particular if it is in TeX or with the TeX rendering-style of a scientific publication). Similarly, in 906: Advertising Discovery, Randall muses on how we automatically trust anything formatted in Wikipedia style. (This was later proven in a scientific study.) And on a different note, prestigious-sounding but meaningless names also appear in the title text for 1068, where SwiftKey suggests the phrase "Massachusetts Institute of America" to Randall.

#1848: Glacial Erratic

June 09, 2017



"This will take a while, which sucks, because I'm already so busy chiseling out igneous intrusions from rock formations and watching Youtube loops of the Superman fault-sealing scene over and over."

Explanation

Ponytail and Megan are walking along when they come across an erratic rock (which differs from the surrounding geology and is brought there by glacial action). Not wishing to bow down to the forces of nature, Megan tries to take it back to its rightful place, obviously in vain.

Megan is annoyed with the glacier for just littering the place up with rocks. She wishes to put it back in place, just like picking up a piece of litter and putting it in the trash bin where it belongs.

The title text furthers the absurdity by suggesting that Megan is extra annoyed with having to clean up after the glacier, because it will take a long time (and as she put it "Fuck Glaciers"). The problem for Megan is that she is already using her time chiselling out igneous intrusions which is another type of rock formation caused by solidification of magma, which Megan also plans to undo. To soothe her mind she keeps watching the scene from the Superman film where Superman turns back time to prevent an earthquake and thus also create a fault-sealing by reversing the creation of the fault in the first place. He also prevents the destruction of the Hoover Dam and the death of Lois Lane, but it seems like this is not important to Megan. She is only interested in undoing what nature has already done, and if the Superman scene could be made real it would solve her problems.

This may be a play on words based on the word "erratic," as Megan's behavior could be described as such.

Megan's actions here are reminiscent of the ones carried out by Cueball in 1119: Undoing.

#1849: Decades

June 12, 2017

1960	1970	1980	1990	2000	2010	2020	2030
60s MUSIC	70s MUSIC	80s MUSIC	90s MUSIC			20s MUSIC?	
60s FASHION	70s FASHION	80s FASHION	90s FASHION	FASHION	MUSIC	20s FASHION?	
60s MOVIES	70s MOVIES	80s MOVIES	90s MOVIES			20s MOVIES?	
60s CULTURE	70s CULTURE	80s CULTURE	90s CULTURE		CULTURE	20s CULTURE?	

IT'S WEIRD HOW FOR 20 YEARS WE STOPPED GROUPING OUR CULTURAL MEMORIES BY DECADE
BECAUSE "2000s" IS AMBIGUOUS AND "AUGHTS" AND "TEENS" NEVER REALLY STUCK.

In the **90s**, our variety radio station used the tagline "the best music of the **70s**, **80s**, and **90s**." After **2000**, they switched to "the best music of the **80s**, **90s**, and today." I figured they'd change again in **2010**, but it's **2017** and they're still saying "**80s**, **90s**, and today." I hope radio survives long enough for us to find out how they deal with the **2020s**.

Explanation

From the 1960s to the 1990s, it was common to group eras by decades. Fashion, music, and other cultural trends that changed relatively quickly were often defined by those decades. People casually and commonly referred to "the sixties", and so on, to separate these periods.

This pattern broke down after 1999, because it didn't naturally lend itself to an analogous phrase for the year from 2000-2009. A number of different terms have been proposed and used: "the Aughts", and "the noughties" had been used for 1900-1909, but have an archaic flavor that may not work for everyone. "The "2000s" and "the millenium" are ambiguous and clunky. None of these terms ever became popular enough to become a consensus term. Similarly for the period from 2010-2019, terms like "the 2010s" and "the teens" have been used, but not widely accepted.

The practical upshot of all of this is that verbally splitting time periods into clear decades simply became less obvious for the periods since 2000. While people still refer to earlier time periods by decades, it is far less common to do so when referring to recent years. The roll-over text gives the example that we still refer to "music of the '80s and '90s" (although the comic omits the apostrophes that might normally indicate the missing century digits), but rarely refer to "music of the 2000s" or something similar.

The time-line in the comic stretches into the future (as of the time of publication), and uses question marks to present uncertainty over whether the decade-grouping trend will return in the 2020s. On the one hand, such was a well-established custom, and we once again have clear language for it. On the other hand, after largely abandoning the custom for 20 years, it is far from certain that people will adopt it again.

What isn't mentioned in the comic, but may be relevant, is that, in the absence of those decade categories, it has become more common to refer to time periods and the people who grew up in them by somewhat arbitrary generational categories: Baby Boomers, Generation X, Millenials, Gen Z, and so on. This has provided an adequate substitute, since youth culture in the 2000s and 2010s has been more commonly defined as millennial culture". There are drawbacks to this (both because the terms are more loosely defined, and because they often come with negative connotations), but these trends may have become sufficiently ingrained that they could displace the older decade-based divisions.

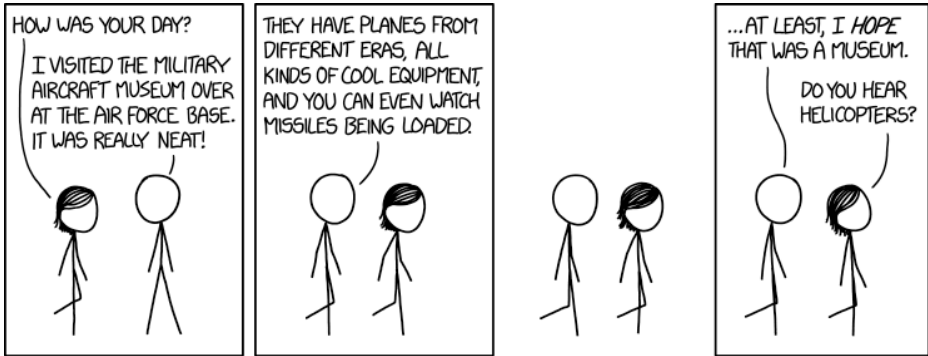
The title text gives the specific example of Randall's local radio station dividing music by decades, and points out they simply started talking around the decades from 2000 to 2019. He implies that whether they resume this pattern in the 2020s will be a good indicator of whether this speech pattern will resume, but expressed doubt whether radio will last long enough to find out. This is a jab at the radio industry, which has been in decline for a long time as it has faced increasing competition from

other communications technologies. While it is unlikely that the radio industry will cease to exist in the near future, further decline seems probable.

Twenties were discussed again later in 2249: I Love the 20s.

#1850: Air Force Museum

June 14, 2017



I had fun visiting the museum at Dover Air Force Base, unless they don't have a museum, in which case I've never been to Delaware in my life.

Explanation

Megan asks Cueball about his day. He tells about his visit to a military aircraft museum at the air force base and lists some of the things he saw. It starts with things you would expect at a typical museum, such as a mix of aircraft from different eras, before revealing the fact that Cueball was able to watch missiles being loaded, which is something that would be out of place and potentially dangerous at a museum. Realizing this, Cueball remarks that he hopes that he was at a museum, and Megan asks him if he hears helicopters. The implication is that Cueball observed not an aircraft museum, but actual military operations at the base, and the military is now scrambling aircraft; either to pursue Cueball and arrest him, or to deploy for some battle nearby.

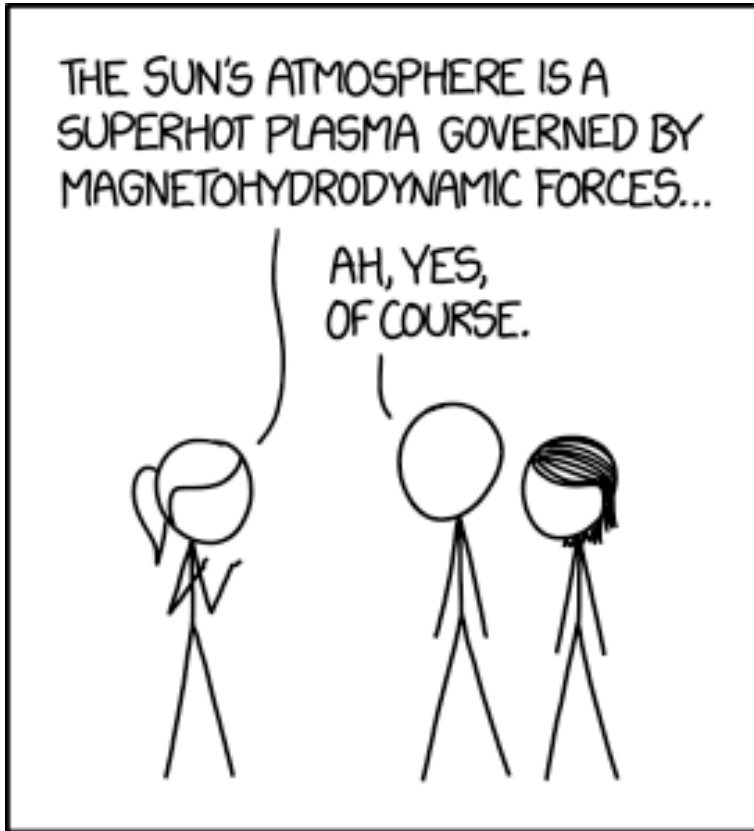
The mention of "planes from different eras" alludes to the fact that military aircraft are often still in use after a much longer time than they were originally designed for. An example of this are the US Air Force's B-52 bomber, first introduced in 1955 (62 years before the publication of this comic) and expected to serve into the 2040s. Additionally, aircraft museums typically house military aircraft from previous eras, such as from WWII and the Cold War, to show the evolution in aircraft design and to showcase technological advances.

The title text builds on this premise. Randall says that he had fun visiting another Air Force "museum" near Dover, the capital of Delaware, but he adds that if they

don't have a museum (in which case he was trespassing on a military base) then he denies ever having been anywhere near it. Fortunately for Randall, there is in fact an Air Force museum nearby: the Air Mobility Command Museum about half a mile south of the Dover Air Force Base.

#1851: Magnetohydrodynamics

June 16, 2017



WHENEVER I HEAR THE WORD
"MAGNETOHYDRODYNAMIC" MY BRAIN
JUST REPLACES IT WITH "MAGIC."

Magnetohydrodynamics combines the intuitive nature of Maxwell's equations with the easy solvability of the Navier-Stokes equations. It's so straightforward physicists add "relativistic" or "quantum" just to keep it

from getting boring.

Explanation

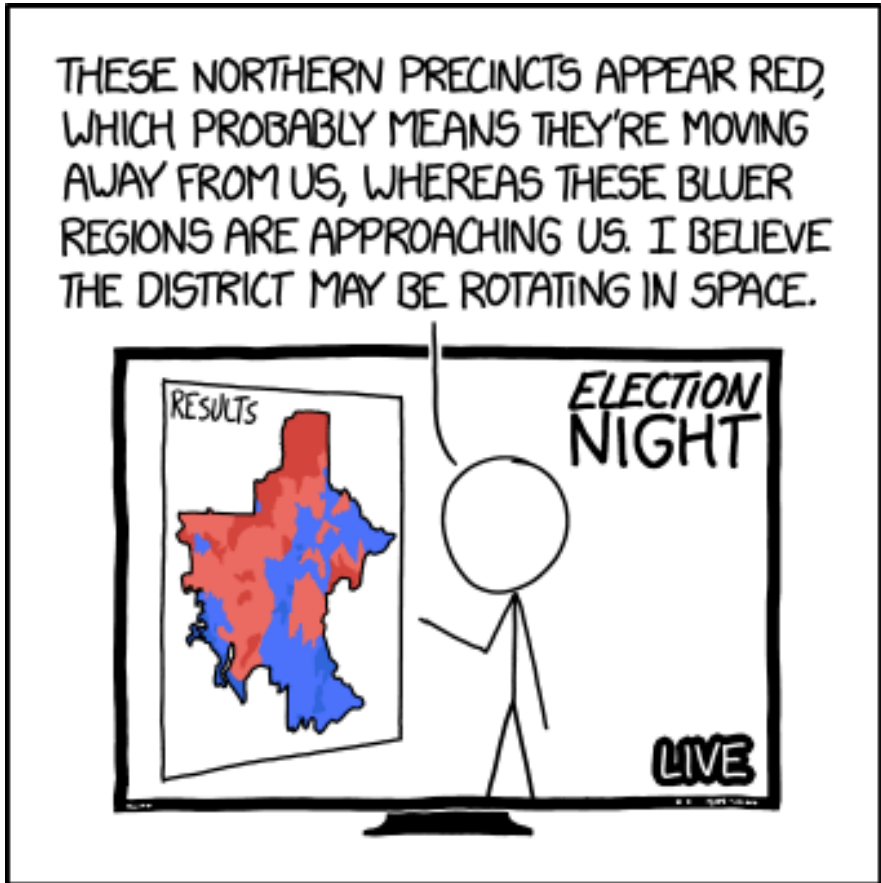
In this comic, Ponytail explains to Cueball that the Sun's atmosphere is a super hot plasma controlled by "magnetohydrodynamics" (a real word), the study of magnetic properties of electrically conducting fluids. This is true, as plasma is both electrically charged (following the laws of electrodynamics) and a fluid (following the laws of hydrodynamics). However, the combination is so difficult for Cueball that he finds it easier to comprehend any statements containing the word "magnetohydrodynamic" by dropping the central part of the word ("netohydrodynam"). Thus, he pretends that Ponytail instead said "The Sun's atmosphere is a superhot plasma governed by magic forces". If Cueball really thinks that magic is more comprehensible than magnetohydrodynamics, then considering just how vaguely and inconsistently magic is portrayed across fiction, that must mean that magnetohydrodynamics is really, really hard![citation needed]

In the title text, Randall riffs on the nature of two different types of equations. It suggests that Maxwell's equations are intuitive (this is not how they are considered) and that Navier–Stokes equations are trivial to solve (also far from true, being a prizeworthy problem). The suggestion being that magnetohydrodynamics is both intuitive and comes with easy solutions (based upon the other assertions, one can safely assume that the chances of such are low). But physicists, it is purported, like to 'spice up' anything that

is too mundane, with words commonly encountered when discussing quantum mechanics and the theory of relativity. This also leaves us with the possibility that even these two fields are littered with the buzzwords we all know and love just to make them 'seem less boring than they are'.

#1852: Election Map

June 19, 2017



MY CAREER AS AN ELECTION ANALYST WAS SHORT-LIVED.

Luckily for my interpretation, no precincts were won by the Green Party.

Explanation

A wave (e.g. an electromagnetic wave, like light) changes its frequency and wavelength when its source is moving relative to the observer, due to the Doppler effect. In the case of light, increased frequency — indicating movement towards the observer — is called blueshift, while reduced frequency — indicating movement away from the observer — is called redshift. These names apply even if the effect is outside of the visible spectrum (e.g. infrared light that has reduced frequency is called redshifted, even though its frequency is further away from that of visible red light than normally). Red and blue colors are used accordingly to indicate the effect.

The recent advent of the integral field spectrograph allowed astronomers to produce images illustrating how different parts of a galaxy move along our sightline, images that look not very different from the map Cueball shows. If one side of the image is higher redshifted while the other side is less or even blueshifted, the usual interpretation is that the galaxy is rotating with an axis of rotation not completely parallel to our sightline, but other interpretations are also possible. Nevertheless no redshifted object appears in red to the human eye, it's still white. But the spectral lines are shifted. This means all colors used in those scientific images are not real.

The map Cueball shows represents election results. Red regions mark where one of the political parties won, while blue regions indicate another party. (These are

common colors to represent political parties throughout the world. Because Randall lives in the United States, blue most likely corresponds to the Democratic Party, and red to the Republican Party, but this is not stated in the comic.) Cueball, however, analyzes the map as if it showed the magnitude of Doppler effect by the light emitted by the region. This is a very strange interpretation in the context of an election, and is not what the viewers would expect to hear. This is why Cueball was quickly fired from his job, as the caption states.

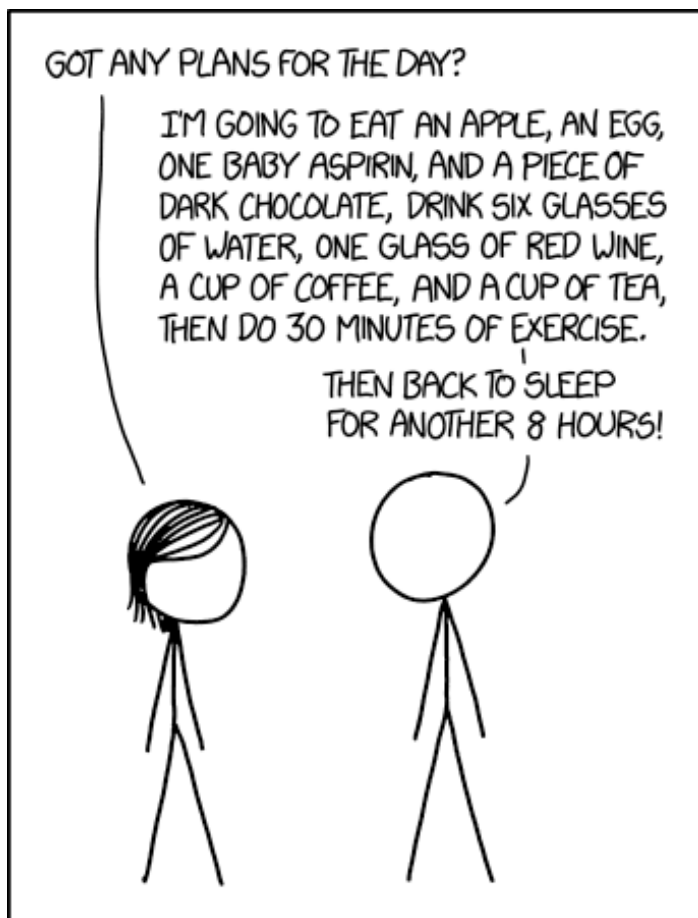
The title text states that the Green Party did not win any precincts. If the Green Party won, its regions would likely be colored green,[citation needed] which would not fit to Cueball's Doppler effect analysis. Sometimes, however, green is used to indicate lack of movement. And since the center of rotating object isn't moving, green-colored spaces could actually be interpreted according to Doppler analysis - but only if they appeared near the center of the rotation.

The map appears to depict Georgia's 6th congressional district, which was set for a runoff election on June 20, 2017, the day after the comic ran. The map in the comic appears to be broadly similar to both the result maps of the primary ballot of April 18, 2017 and the result map of the runoff election. The April primary had included 5 Democratic candidates, 12 Republican candidates, and 2 independent candidates (who combined for less than 0.1% of the primary vote), with the top two finishers (who were a Democrat and a Republican) advancing to

the runoff. The red-and-blue result maps were similar for the primary and runoff elections because the precincts where Democratic or Republican candidates predominated in the April vote also (generally speaking) tended to have the candidate of the same party lead the vote in June.

#1853: Once Per Day

June 21, 2017



I ONLY DO THINGS THAT NEWS STORIES HAVE
SPECIFICALLY TOLD ME TO DO ONCE PER DAY.

I'm not totally locked into my routine—twice a year, I take a break to change the batteries in my smoke detectors.

Explanation

Many news reports on health recommend the "best" way to perform the processes, such as eating, drinking, exercising, or sleeping, that are required to live healthy. These reports tend to give such factors as a type of food to consume regularly, the amount of a nutrient to consume, or how long to exercise, in terms of what or how much to do daily. A simple example of this is the proverb, "An apple a day keeps the doctor away." Perhaps this kind of advice is overthinking things, but Cueball decides to follow it strictly as explained in the caption.

So when Megan asks Cueball what his plans are, he just lists his routine consisting only of things that the news has told him exactly how often to do.

His list includes the following, which he has to do once per day:

- Eat an apple - This references the common old wives tale of "an apple a day keeps the doctor away"
- Eat an egg - One egg would provide protein. This could also be a stand in for "breakfast is the most important meal of the day"
- Take one aspirin - Aspirin can reduce heart issues. Baby aspirin would contain a lower dose and be safer.
- Eat a piece of dark chocolate (see also John Bohannon's chocolate study for an example of how bad science can wind up as such "you should do ... daily" suggestions in

the media) - Dark chocolate would contain more antioxidants and less sugar.

- Drink six glasses of water - There is a common, long standing myth that you're supposed to drink X amount of water per day. Some say 6 or 8 cups. A liter or two. etc. etc.
- Drink one glass of red wine - Always used as a "health can be fun" example. Wine is reputed to contain significant antioxidants, and one glass a day has been advanced as a "safe" amount to drink.
- Drink a cup of coffee - Coffee is one of those health items that has a new health benefit or loss every week, depending on which media outlet you follow.
- Drink a cup of tea - Tea's health benefits are a very common subject. There is much media talk about the benefits of different types of teas, usually focused around Green Tea.
- Get 30 minutes of exercise - Different media outlets give different amounts of exercise to do. Usually, they tend towards 15-30 minutes a day to sound easy and low commitment.
- Get 8 hours of sleep - An average adult needs 6-8 hours of sleep daily, but this varies per person, and by age.

Several obvious problems arise with these "you should do ... daily" tips. They are often based on population studies, but they may be harmful in the case of some individual persons. This health-related advice would be beneficial in, say, 60 or 70% of the population, but may be ineffective in other 20% of the people, and deleterious in

10%. This especially relates to the suggested daily intake of aspirin.

The second problem is the shaky scientific foundation of this advice. Some of this advice (such as eating an apple a day and drinking six glasses of water) is based on old sayings without any clear scientific backing. Other pieces (such as a daily aspirin, or a glass of red wine), were based on preliminary studies, and subsequent conflicting data has thrown them into serious doubt (the benefits may be smaller or non-existent, and may be outweighed by the negative effects). It is unfortunately common for news outlets to excitedly report on individual studies that show intriguing results, giving the public the impression of scientific consensus, while actually scientists are still cautioning that there's not enough evidence to make clear recommendations.


Moreover, Cueball implies that he only does these things every day. It's not clear whether following all of these pieces of advice take up all of his time, or whether he considers each day to be complete when he's finished his daily tasks (other than sleeping and exercising, the other things on the list shouldn't take up much time). In any case, doing nothing other than those specific routines would be harmful in a variety of other ways.

In the title text Cueball explains that his daily routine is not completely fixed. It is broken twice a year, since he also follows public information campaigns suggesting the replacement smoke detector batteries twice a year. While the US National Fire Protection Association

recommends a replacement at least once per year others suggest every time when the clock changes according to daylight saving time, i.e. twice a year. (All such recommendations will likely become irrelevant as citizens of the United States, starting in California, are encouraged to replace their existing smoke detectors with new models containing irremovable ten-year batteries.) This is just another example for official overdone recommendations nobody follows, in this case since smoke detectors make annoying beeps when their batteries run low and thus rarely need routine replacements before then.

#1854: Refresh Types

June 23, 2017

REFRESH TYPE	EXAMPLE SHORTCUTS	EFFECT
SOFT REFRESH	EMAIL  BUTTON	REQUESTS UPDATE WITHIN JAVASCRIPT
NORMAL REFRESH	F5, CTRL-R, ⌘R	REFRESHES PAGE
HARD REFRESH	CTRL-F5, CTRL-⇧, ⌘⇧R	REFRESHES PAGE INCLUDING CACHED FILES
HARDER REFRESH	CTRL-⇧-HYPER-ESC-R-F5	REMOVELY CYCLES POWER TO DATACENTER
HARDEST REFRESH	CTRL-⌘⇧⇧-R-F5-F5-ESC-O-⌘-⇧-SCROLL LOCK	INTERNET STARTS OVER FROM ARPANET

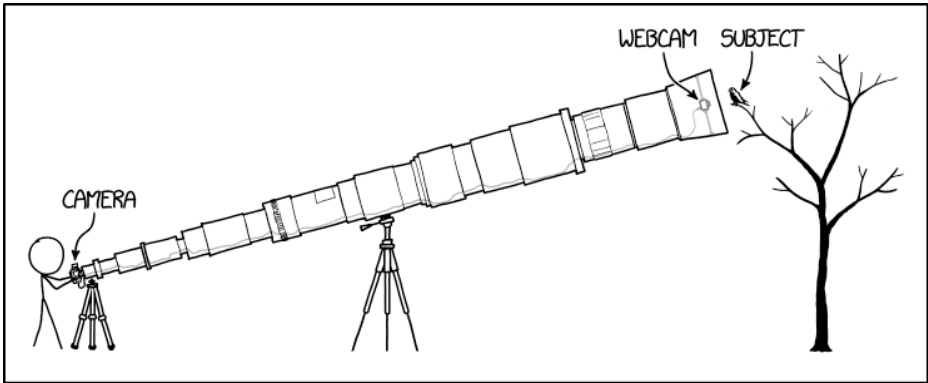
The hardest refresh requires both a Mac keyboard and a Windows keyboard as a security measure, like how missile launch systems require two keys to be turned at once.

Explanation

Explanation section not found.

#1855: Telephoto

June 26, 2017



TELEPHOTO TIP: IF YOU ADD ENOUGH CONVERTERS AND EXTENDERS, YOU DON'T ACTUALLY NEED A FANCY LENS.

I was banned from the airliners.net photography forum by concerned moderators after the end of my lens started brushing against planes as they flew by.

Explanation

This is another one of Randall's Tips, this time a Telephoto Tip.

Telephoto lenses are special lenses for cameras that are physically shorter than their focal length. Using a long-focus lens allows the photographer to magnify a photographic image of an object rather than being physically close to the object. Alternatively one could add "converters" and "extenders" to an existing lens to get a greater focal length for the cost of reduced brightness. The joke is that Cueball did not want to spend the money on buying a new telephoto lens or real converters, and instead achieved the same effect by moving his cheap camera (a standard webcam, in this case) close enough to the subject to obviate the need for magnification.

There are many problems with this. First, the end result is completely impractical to carry around; as shown in the comic, Cueball has to set up two tripods just to support the weight of his hulking behemoth of a camera. Second, if you're an animal photographer like Cueball, you need to be able to see the animal as close up as possible in order to get a good picture; a lens with lots of magnification power accomplishes just that without alerting the animal to the photographer's presence, but Cueball's camera would surely scare off any birds he tried to photograph (except in fanciful proof-of-concept diagrams like this comic).

Perhaps most damning of all, though, is the fact that Cueball's idea involves installing a webcam at the far end to be able to photograph anything. Webcams are not designed to capture high-resolution images, so the resulting image will be of considerably lower quality compared to professional photographers' works, although it could be better than a standard camera setup taking account of the huge achievable zoom levels. But more importantly, the presence of the webcam renders the functionality of the extenders (and the base camera itself!) completely redundant, cementing this idea as a total waste of money and effort. The same could be achieved by mounting the webcam on a long stick; an extraordinary long selfie stick will achieve nearly the same effect, for considerably less cost and set-up than Cueball's behemoth.

The title text continues this by saying he was banned from the Airliners.net photography forum because his new modified lens was so long that it started brushing against planes as they flew by. If Cueball's gargantuan lens is being set up on or near runways or is so long that it potentially damages planes in-flight, then being banned from an online forum should be the least of his worries.[citation needed] In-flight damage dealt to planes can cause severe consequences, e.g. causing them to crash. This would possibly put him on the no-fly watchlist, as well as being charged with unintentional damage.

#1856: Existence Proof

June 28, 2017



Real analysis is way realer than I expected.

Explanation

In mathematics, an existence proof is a proof that only shows that an object with a specific property exists, but does not tell what this object is. For instance, if f is a continuous function such that $f(0) = 0$ and $f(100) = 2$, it is easy to prove that there exists an x between 0 and 100 such that $f(x) = 1$ (as in the comic). However, this proof gives no way to find such an x .

In many situations, a proof of existence is enough to satisfy a mathematician, but in others, it is desirable to actually identify the object whose existence has been proven.

The full statement itself seems like a solution to some kind of function composition problem. Seems like what the class has proven is that if you apply certain function $G(x)$ to a starting point of function $f(0)$, then what it will do is just give you a value of $f(x)$ at some other value of x , existence of which is stated to be proven. The sentence "There exists some number x such that $f(x)=G(f(0))=1$." boils down to "There is an x such that $f(x)=1$ ". The part with $G(f(0))$ is only a way to arrive at 1. For some reason there is an x that satisfies $f(x)=G(f(0))$, and since $G(f(0))=1$, it is equivalent to $f(x)=1$.

In the comic, Miss Lenhart (and students) take this one step further, by taking up arms to destroy the function value, which they have proven to exist. In the last panel, some students off screen begin to wonder if they are in

the right class, as normal math classes do not take up swords to fight abstract concepts.[citation needed] Another student remarks that they are finally in the right math class, implying that this is the kind of thing they wanted from their math curriculum all along.

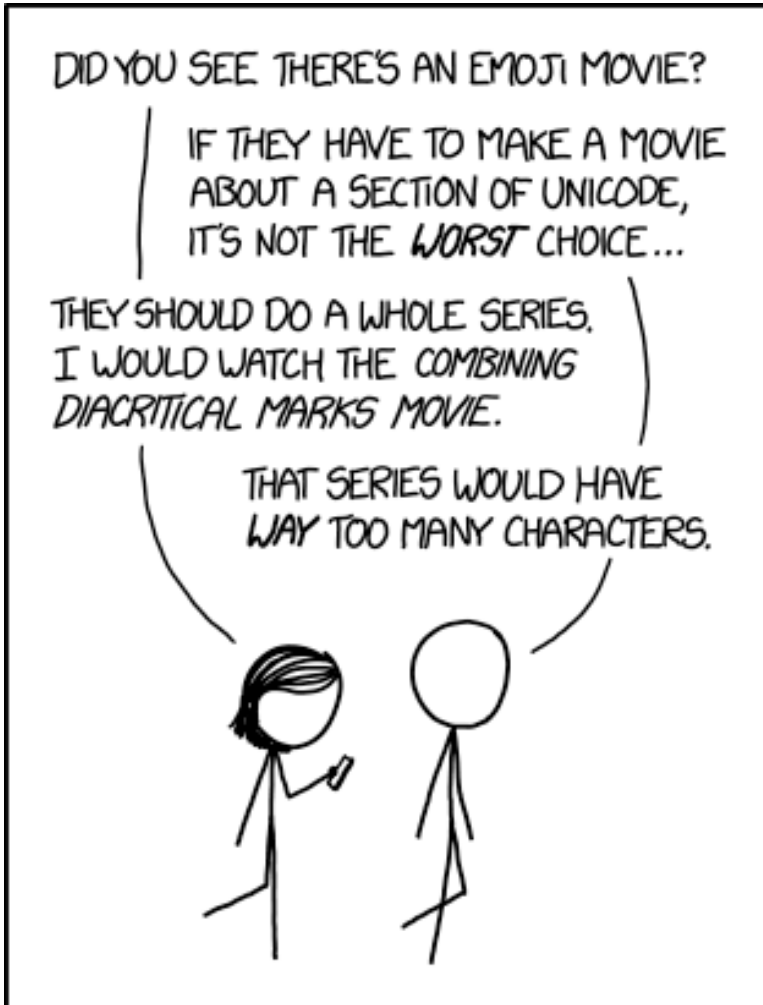
The phrase "We ride" is commonly used in rallying battle cries, particularly in fantasy or medieval dramas where characters are preparing to enter combat on horseback. Variations of the phrase are used several times in *The Lord of the Rings*, for example.

The title text refers to Real Analysis, a branch of mathematics dealing with real numbers and real-valued functions (as opposed to studies dealing with integers, rational numbers, imaginary numbers in the complex plane, etc.). As the speaker implies, Real Analysis is supposed to remain confined to the theoretical realm of mathematics; certainly nobody signing up for such a class would ever expect to be embroiled in a crusade against intangible constructs! Taken out of its mathematical context, "analysis" literally means "breaking down", referring to the teacher's intention to cut things up with a sword. The use of the uncommon word "realer" conveys that the situation has suddenly developed unusually high stakes (as in the phrase "shit just got real"). This nuance would be lost if the word "realer" were replaced with the technically correct phrasing of "more real".

This may be a continuation of 982: Set Theory, where numbers were "executed" to prove a point.

#1857: Emoji Movie

June 30, 2017



Some other studio should do the *Antz/A Bug's Life* thing and release *The Dingbats Movie* at the same time.

Explanation

Megan asks Cueball if he knows about the then-upcoming The Emoji Movie. It was released on July 28, 2017, a month after this comic, and had been widely reviled on the Internet for its lack of original plot, characters, and jokes.

Cueball responds to the topic by damning it with faint praise, starting with the presumption that somebody had to make a film about a "section of Unicode".

Unicode is the standard by which almost all modern text, in all languages, is represented as computer data. It consists of thousands of "code points", grouped into about 280 contiguous sections known as "blocks". There is no formal term "section of Unicode", which Randall seems to be using to skirt the fact that emojis are not all represented within one Unicode block.

Examples of potential Unicode blocks include "Playing Cards", "Musical Symbols", "Tibetan", "Hangul Jamo Extended-B", "Braille Patterns" – and of course "Combining diacritical marks" and "Dingbats", referred to in the comic.

Emojis are standard pictograms which include smileys (e.g. 😊) and common objects such as beer (🍺) and eggplant (🍆). Dating from the late 1990s, they were added to Unicode in 2010. There is actually no Unicode block known as "Emojis". There is Emoticons

(U+1F600..U+1F64F), which contains 80 code points, mostly of facial expressions. However it does not include all emojis. For instance, "Baby" (👶) is U+1F476, within the Miscellaneous Symbols and Pictographs block.

The topic of emoji in Unicode also appears in 1813: Vomiting Emoji.

Megan responds to this presumption by facetiously suggesting that Hollywood should make a series of films about different code blocks, referencing Hollywood's current trend of reducing risk by making many sequels and adaptations. She proposes a movie about Combining Diacritical Marks (see 1647: Diacritics), a different section of Unicode which contains 112 code points (each assigned to a character). These code points include many varieties of diacritics such as accents, cedillas and tildes which can be combined with other letters to produce an almost unlimited number of possibilities, such as "Ÿ" (Cyrillic U plus breve).

Cueball quips that this series would have too many characters. This is a pun on the word "character", which has the double meaning of a fictional character, or a symbol which corresponds to a grapheme (e.g. letter, digit, punctuation mark). It's true that although the Combining Diacritical Marks movie would have only 112 characters, the series as a whole would have tens of thousands, including such epics as "Egyptian Hieroglyphs" (1,071) and "CJK Unified Ideographs Extension B" (42,720).

The "Antz/A Bug's Life thing" in the title text refers to the twin films phenomenon, in which two films with very similar (or identical) concepts are released within roughly the same timeframe. Competing studios Dreamworks and Pixar released their respective insect-oriented films in 1998, a year infamous for many other such film pairings (see the Wikipedia article for a full list).

Dingbats were an early form of pictograph included within the normal mechanisms for producing computer text, serving a similar function to emojis, but oriented towards practical symbols such as telephones, airport symbols and a wide variety of arrows. Unlike emojis, they are usually black-and-white. Previously, dingbats required a specific font to render, but as part of Unicode (U+2700–U+27BF), they can now be displayed in a variety of fonts. For example: Some characters are both dingbats and emoji, and are followed with a variant-selector character to indicate whether they should be in color.

The joke is that although dingbats and emojis are superficially equivalent, a film which contains many cute human expressions would have much more potential for success than one about dry symbols such as arrows, asterisks and scissors.

Megan and Cueball's discussion about the movie is continued in 1870: [Emoji Movie Reviews](#).

#1858: 4th of July

July 03, 2017

4TH OF JULY ACTIVITIES

2014 — WATCHING FIREWORKS

2015 — WATCHING FIREWORKS FROM DRONES

2016 — FLYING DRONES THROUGH FIREWORKS

2017 — INTERCEPTING FIREWORKS WITH DRONES

2018 — COMPETITIONS TO HIT DRONES WITH FIREWORKS

2019 — TEAMS COMPETE TO SHOOT DOWN EACH OTHER'S FIREWORK-ARMED DRONES

2020 — SENTIENT FIREWORK-ARMED DRONES OVERTHROW HUMANS

2021 — DRONES CELEBRATE INDEPENDENCE DAY

Strangely, they still celebrate by eating hot dogs. Since they don't have mouths, they just kinda toss them in the air and let them fall back down into their propeller blades. It's pretty messy.

Explanation

In the United States, the 4th of July is celebrated as Independence Day. This comic claims to show the timeline of different activities that are used to celebrate the holiday. One common activity is to watch fireworks displays. With the rise of personal drones there have been several videos of fireworks from drones, including flying the drones through the middle of the display. The comic then purports that starting in the year it was published (2017), fireworks and drones will be at some sort of war with each other, starting with drone pilots leading their drones into the path of the rising fireworks before they explode, leading to fireworks technicians intentionally trying to strike down drones. In 2019, Randall posits that the drones will be weaponized with fireworks and competitions will be held to shoot down your opponents' drone. This wanton destruction of drones leads them to turn against their pilots and humanity in 2020 (after gaining sentience, presumably by their AI evolving through the competition), and then in 2021, they will be celebrating their Independence Day from the humans. As of March 16, 2025, drones have not yet overthrown humans.[citation needed]

Despite the many unfortunate events that happened in 2020, sentient firework-armed drones overthrowing humans was not one of them.[citation needed]

The title text refers to another popular 4th of July activity in the United States: Barbecues with fare such as

hot dogs and hamburgers. But since the drones don't have mouths or a digestive tract, they simply make a mess by using their rotors as a blender.

#1859: Sports Knowledge

July 05, 2017



I KNOW A HANDFUL OF VERY SPECIFIC THINGS, BUT AFTER THAT MY SPORTS KNOWLEDGE FALLS APART QUICKLY.

I heard they might make the wild card game, which would be cool. Do you know when that is? I have a wedding next weekend, but if it's after that we could try to go!

Explanation

Cueball, representing Randall, demonstrates that he has some knowledge about Mike Trout, a baseball player for the Los Angeles Angels. However, he mixes up the Los Angeles baseball team for one of the city's basketball teams when he mentions the Lakers. White Hat questions his mentioning of the Lakers, after which Cueball takes another wild guess, this time mentioning an American football team, the Denver Broncos, based in Denver, Colorado, over 800 miles (1300 kilometers) away from Los Angeles, indicating even poorer knowledge about sports.

On-base plus slugging (OPS) is a baseball statistic calculated as the sum of the on-base percentage (the number of times a player reaches base divided by the number of plate appearances) and slugging percentage (singles + 2 times the doubles + 3 times the triples + 4 times the home runs divided by at bats). It is useful for figuring out how well a player reaches base and hits for power. As of the date this comic was published, Trout's OPS for the 2017 season at 1.203 was indeed higher than in any of his previous seasons, albeit over a smaller number of games because Trout indeed suffered a thumb injury in late May and had not played since then. (He returned to play starting on July 14.)

At the end of the season, the teams leading each division make the playoffs, along with a certain number of other teams. In the NFL (with 8 division winners) and MLB

(with 6 division winners), 4 extra teams make the playoffs, and, in the NBA (also with 6 division winners), 10 teams beside the division winners qualify for the playoffs. In baseball the two teams in the American League play a Wild Card game against each other, as do the two in the National League, and in American football, there are Wild Card games in which the two wild card teams per conference play the two lower seeded division winners. At the time of publication, the Los Angeles Angels were, indeed, in the running for a wild-card spot (2½ games out of the playoffs).

With the baseball season being halfway over (and thus months away from the Wild Card games in early October) and both football and basketball being in the off-season, Cueball further shows his lack of sports knowledge in asking whether it is next week, and assuming that he could spontaneously decide, at game time, to just go. He could make a decision to go now, but he would have to wait until the season is almost over when the seeding for the playoffs and wild card spots are decided. Sometimes the wild card spots aren't decided until the last game of the season; since MLB rules dictate that the Wild Card team with the better record hosts the game, this scenario would complicate the process of buying the tickets (which could be sold out prior to game time due to high demand), as well as other logistical matters (such as traveling to the game; if Cueball were located in the East Coast of the United States and the game were hosted by the Angels, Cueball would need to take a cross continent flight). In the end, the Angels were

eliminated from postseason contention on the final weekend of the season, making Cueball's wish impossible until the next season.

As the caption says, he demonstrates that he has very specific knowledge in the topic but stumbles when anything out of his narrow field of view is brought up, similar to 132: Music Knowledge.

To compensate for his lack of interest and knowledge in sport Randall made the comic 1107: Sports Cheat Sheet, and he has before directly mentioned his missing knowledge in 1480: Super Bowl. (See more comics linked in those two).

#1860: Communicating

July 07, 2017



You're saying that the responsibility for avoiding miscommunication lies entirely with the listener, not the speaker, which explains why you haven't been able to convince anyone to help you down from that wall.

Explanation

There's glory for you.

In Lewis Carroll's "Through the Looking-Glass, and What Alice Found There", Alice meets Humpty Dumpty (the egg-shaped character from the children's verse). Humpty Dumpty is a Looking Glass creature, and the Looking Glass creatures all feature some form of inversion. For Humpty Dumpty the inversion is in meanings. When they first meet, Humpty Dumpty berates Alice for having a name that doesn't mean anything (contrasted with his name which means his shape).

But later, Humpty declares to Alice "There's glory for you". Alice doesn't understand what Humpty means by "glory". Humpty explains that he can make words mean whatever he chooses to mean. By "glory" he meant "a nice knock-down argument". And he adds: "When I use a word, it means just what I choose it to mean. Neither more nor less." ()

In the comic Humpty is explaining to "Alice" (portrayed by Jill) that he can choose meanings for his words. Alice points out the obvious problem by pretending to wonder what meaning should be given to that utterance, and decides it means "Please take all my belongings". Humpty realizes he has been caught in a trap, but now Alice is choosing meanings, and even his protests are taken to mean "take my car along with my belongings".

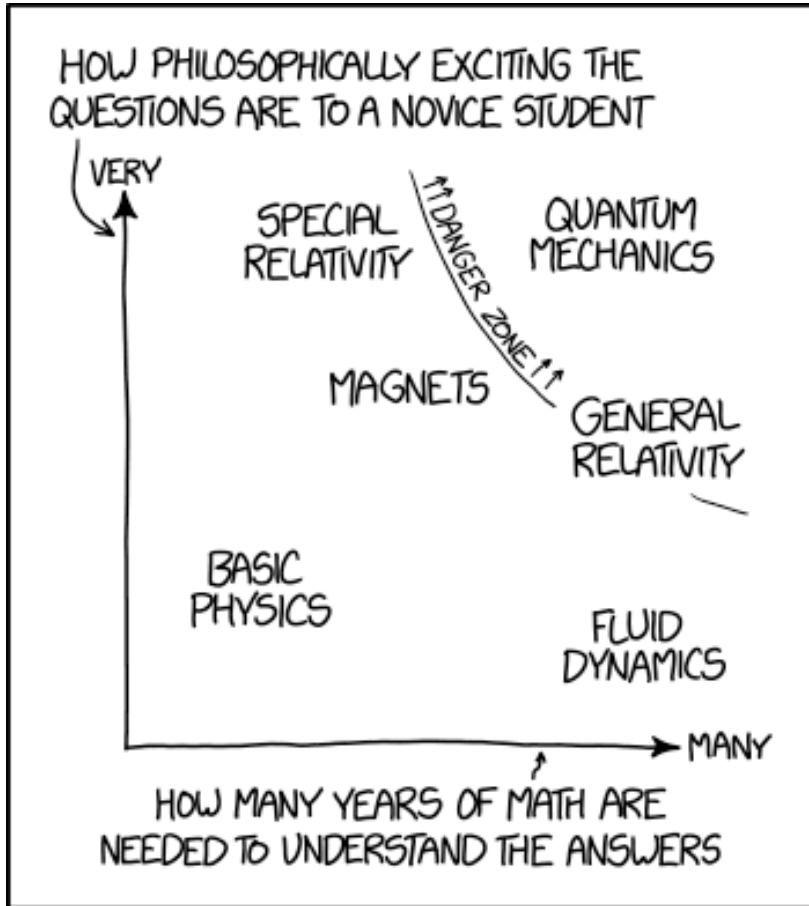
While it seems that Alice chooses these specific meanings of words to educate Humpty Dumpty about the mistake in his way of thinking, she could as well inform him about planned theft with random, meaningless words or not at all. After all, she got "permission". Also, even though Humpty Dumpty decides about the meanings of words by himself, he "accidentally" chooses the normal meanings of all of Alice's words, because otherwise he wouldn't be informed about the planned theft and wouldn't be able to react to this with "What!? No!".

Humpty Dumpty is known from the nursery rhyme or riddle:

Carroll's Humpty Dumpty is a parody of people who use technical language without defining their terms and expect others to understand. The title text continues this. By Humpty insisting that he is not responsible for others understanding him he is unable to get help getting down from the wall, which will lead to his inevitable demise. This two-sided nature of communication is also shown in the title text of 1028: Communication, as well as in later comics like 1984: Misinterpretation (with a list of other comics about communication).

#1861: Quantum

July 10, 2017



WHY SO MANY PEOPLE HAVE WEIRD
IDEAS ABOUT QUANTUM MECHANICS

If you draw a diagonal line from lower left to upper right,
that's the ICP 'Miracles' axis.

Explanation

The comic depicts a relationship between how philosophically exciting the questions in a field of study are, versus how many years are required to understand the answers. For example, special relativity poses very intriguing philosophical questions, such as "can the temporal ordering of spatially separated events depend on the observer?", or "can time run at different rates for different observers?". But it doesn't take a lot of mathematical knowledge to understand the answers - that when objects move very close to the speed of light, time slows down and their lengths contract: the key Lorentz transformations ultimately involve little more than high-school algebra. Hence, Special Relativity is very high up on the y-axis but not very far on the x-axis. Basic physics is not very philosophically interesting but also not very complicated. Fluid dynamics, as captured by the Navier–Stokes equations is very complicated, but it's concerned with a very specific topic - how water or other fluids flow around - so it doesn't lead to big philosophical questions.

The "danger zone" in the top right of the chart is when a field of study is wide-ranging enough to pose broad philosophical questions, and also so complicated that most people can't answer those questions. Quantum mechanics deals with some very strange concepts that readily lend themselves to philosophical questions, such as the idea that merely observing something can change it, or the idea that something can be both a wave and a

particle at the same time. However, the explanation for those phenomena is a very complicated piece of math, notably the Schrödinger equation, which means that most people don't have accurate answers to those questions. Randall suggests that this is the reason why so many people have "weird ideas" about quantum mechanics.

1240: Quantum Mechanics also discusses weird ideas that people have about quantum mechanics.

General relativity also presupposes considerable mathematical sophistication to understand the Einstein field equations. However, the main contribution of GR – the explanation of gravity in terms of a curved spacetime – does not seem to induce a lot of philosophical novelty beyond that already seen in special relativity, possibly with the exception of black holes.


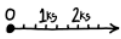
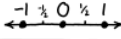





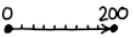

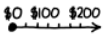
The title text references the Insane Clown Posse (ICP) song "Miracles", made memetic by the lyric "Fucking magnets, how do they work?" An axis is the direction on a graph in which some quantity is increasing or decreasing. So things that are far along the "miracle" axis are presumably more miraculous. As you move from bottom-left to top-right on the graph, items become both more philosophically interesting and harder to understand. It would be fair to describe something that's hard to understand and raises big philosophical questions as a "miracle". The ICP "Miracles" axis would also intersect the topic "magnets" infamously mentioned in the song. Basic physics might, thus, also be considered

miraculous by the ICP.

#1862: Particle Properties

July 12, 2017

PARTICLE PROPERTIES IN PHYSICS

PROPERTY	TYPE/SCALE
ELECTRIC CHARGE	
MASS	
SPIN NUMBER	
FLAVOR	(MISC. QUANTUM NUMBERS)
COLOR CHARGE	 (QUARKS ONLY)
MOOD	
ALIGNMENT	 GOOD-EVIL, LAWFUL-CHAOTIC
HIT POINTS	
RATING	☆☆☆☆☆
STRING TYPE	BYTESTRING-CHARSTRING
BATTING AVERAGE	
PROOF	
HEAT	
STREET VALUE	
ENTROPY	(THIS ALREADY HAS LIKE 20 DIFFERENT CONFUSING MEANINGS, SO IT PROBABLY MEANS SOMETHING HERE, TOO)

Each particle also has a password which allows its properties to be changed, but the cosmic censorship hypothesis suggests we can never observe the password itself-only its secure hash.

Explanation

A table is presented comparing the range (maximum and minimum value) and scale (how big number increments are) of several measures. The table begins by listing properties pertinent to particle physics as the title suggests, but quickly devolves to other domains such as role-playing games (such as D&D) and sports after failing to provide a good definition of flavor.

The title text says that in addition each particle has a password, but only hash of the password can be observed. This is a computer science reference. In computer science, properties (e.g. of an object or program) often can be changed with a single command. In physics as we observe it, properties can locally change with the environment. There are several experiments, whether physical constants are really time-const. Password hashing is the practice of hiding the password itself by storing only an irreversible representation of the password. Since the password itself is not stored, the password cannot ever be viewed by the user or a hacker (outside of the login page). This method is considered to be safest way of storing passwords. Password hashing using some key derivation function makes it impossible to steal passwords even if the server that stores hashes is cracked, unless the hash function is also broken, which should be a task which cannot be completed in any feasible time for sufficiently strong passwords. The title-text claims this is predicted by the cosmic censorship hypothesis, which in reality claims that a gravitational

singularity must always be obscured by an event horizon (i.e.: there can't be a naked singularity). There is also a hint of quantum mechanics in the statement, as observation is one of the central concepts of the field, and Heisenberg's uncertainty principle actually states that it is impossible to observe (measure) some property of a particle with arbitrary precision when another one is known (e.g.: you can't determine the momentum and position of a particle). This makes the title text a mix of several domains, as was the above table.

#1863: Screenshots

July 14, 2017

INTRO TO SCREENSHOTS



SYLLABUS

- HIGHLIGHTING: WHAT & HOW MUCH
- ASPECT RATIOS
- CROPPING: PRE- AND POST-
- WHITESPACE
- SCREENSHOTS VS LINKS
- CATCHING THE RIGHT GIF FRAME
- SNAPCHAT AND TRUST
- EMBARRASSING BACKGROUND TABS
- SPELLCHECK'S RED UNDERLINES
- SECURITY: BEWARE URL TOKENS
- REDACTING PERSONAL INFO
- USEFUL BROWSER MODES
- TRADEOFFS: PNG VS JPG
- WATERMARK ETHICS
- SPOTTING FAKES

MY CLASS ON SCREENSHOTS WAS A BIG HIT,
ALTHOUGH FOR SOME REASON I ONLY EVER
SOLD ONE COPY OF THE DIGITAL TEXTBOOK.

For the final exam, you take a screenshot showing off all the work you've done in the class, and it has to survive being uploaded, thumbnailed, and re-screenshotted through a chain of social media sites.

Explanation

The comic shows a syllabus of an introductory course on screenshots. Screenshots have become a common way of spreading and sharing content on social media like Tumblr and Twitter, particularly excerpts of text such as seen in the cartoon. This in turn has developed into a common language with unwritten rules; the comic imagines a world where such rules have become codified into best practices, able to be taught in classes.

The image on the left shows an image of screenshots of text, along with what seems like annotations describing various ratios and dos and don'ts about making such screenshots. The right side shows the main points of the course, touching on topics that are relevant for making and publishing screenshots. Some of these guidelines are violated on a regular basis by people sharing screenshots on the internet, leading to impaired readability and the degradation of digital quality (see 1683: Digital Data).

The punchline of the comic describes a high attendance in the course (presumably many people are interested in how to take high-quality screenshots); however, the digital textbook only sold one copy, implying that the only attendee that bought the book was adept enough to distribute screenshots of the textbook content to the others, because of the information gathered from the class itself. In essence, the writer of the textbook has taught their students how to pirate their material, effectively putting themselves out of a job. There isn't

anything that the author can do to prevent this due to the analog hole, which states that if non-interactive media can be visually seen by humans, it can be copied, as with a screenshot.

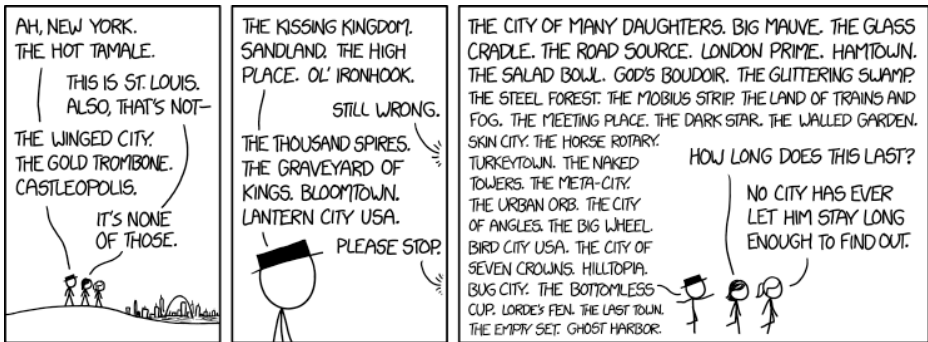
Detailed explanation of the headings on the right:

The title text once again refers to the continual re-screenshotting of data as seen in 1683: Digital Data, where the final examination consists of the students taking a screenshot good enough that it is still recognizable (and hopefully readable) after being re-compressed, re-screenshot and re-uploaded to various social networking sites, deteriorating its quality. This is quite a difficult task, considering the student only has control over the first screenshot, and subsequent screenshots could degrade the quality to any level. Hopefully the professor is aware of this and plans to perform the test under controlled conditions, as well as grade on a curve.

Screenshots were previously explored by Randall in 1373: Screenshot, 1683: Digital Data and 1815: Flag.

#1864: City Nicknames

July 17, 2017



This place has so many demonyms. Northlanders. Fair Folk. Honey Barons. Lake Dwellers. Treasurers. Swamp Watchers. Dream Farmers. Wellfolk. Rockeaters. Forgotten Royals. Remote Clients. Barrow-Clerks. The People of Land and Sky.

Explanation

Cities often have official or unofficial nicknames. For instance, St. Louis, Missouri, is known as "Gateway to the West" among several other nicknames. The nicknames typically invoke some historical or geographic feature of the city, but can sometime be opaque to those not familiar with the city. The full, formal name of Bangkok includes a long list of superlatives translating as "The city of angels, the great city, the residence of the Emerald Buddha, the impregnable city (of Ayutthaya) of God Indra, the grand capital of the world endowed with nine precious gems, the happy city, abounding in an enormous Royal Palace that resembles the heavenly abode where reigns the reincarnated god, a city given by Indra and built by Vishnukarn."

Despite the skyline being clearly recognizable as St. Louis due to the Gateway Arch, Black Hat calls it New York City. However, the nickname he gives is neither a common New York nickname (such as "The Big Apple") nor a St. Louis nickname. Megan tries to correct him, but it becomes clear that Black Hat is making up nicknames. Many of his suggestions are puns for real nicknames of other places.

The title text contains made up demonyms in the same pattern. A demonym is a word for the people who live in a particular place. They are typically derived from the name of the place (e.g. "St. Louisan" for people from St. Louis, or New Yorker for those from New York), but

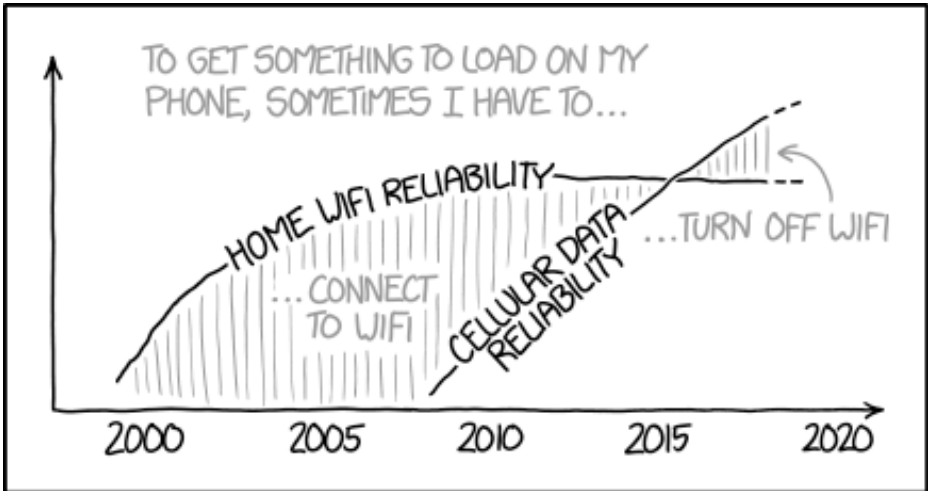
some regions have an informal demonym that can be used colloquially by those familiar with the place to refer to its residents (e.g. Hoosier for people from Indiana).

Though Black Hat may have forgotten, it is more likely that he is messing with those around him

Nicknames and Demonyms[edit]

#1865: Wifi vs Cellular

July 19, 2017



IT SEEMS WEIRD FROM A NETWORKING POINT OF VIEW, BUT SOMETIME IN THE LAST FEW YEARS THIS FLIPPED FOR ME.

According to the cable company reps who keep calling me, it's because I haven't upgraded to the **XTREME GIGABAND PANAMAX FLAVOR-BLASTED PRO PACKAGE WITH HBO**, which is only **\$5** more per month for the first 6 months and five billion dollars per month after that.

Explanation

In this comic Randall remarks on how recent changes in Wi-Fi and Cellular data reliability have impacted his behavior. Wi-Fi technology has had several advantages over cellular data transmission due to Wi-Fi antennas' more ubiquitous distribution and ability to focus on high data transmission rates instead of broad signal coverage. However, as Wi-Fi has become more popular it is increasingly common to encounter Wi-Fi networks using outdated hardware, poorly organized or overburdened networks, and competition for bandwidth with other Wi-Fi devices. Meanwhile due to continued commercial investment in upgrading and expanding cellular networks and the more frequent consumer replacement of cellular handsets, the reliability of cellular data has continued to increase.

Randall notes that prior to 2015 he found that he could improve his internet connection by connecting to a Wi-Fi network instead of using cellular data. After 2015 however, he finds that in many cases he is able to get a stronger connection by disengaging his Wi-Fi connection and getting his data over a cellular connection.

Anything larger than a few kilobytes would previously require someone to switch off network data and connect to a wireless network. However, for a couple of years, cellular networks' data transmission rates have often become more reliable (albeit usually costlier for larger amount of data usage) while home Wi-Fi has remained

fairly constant, meaning the cellular network is often the best choice to download a file.

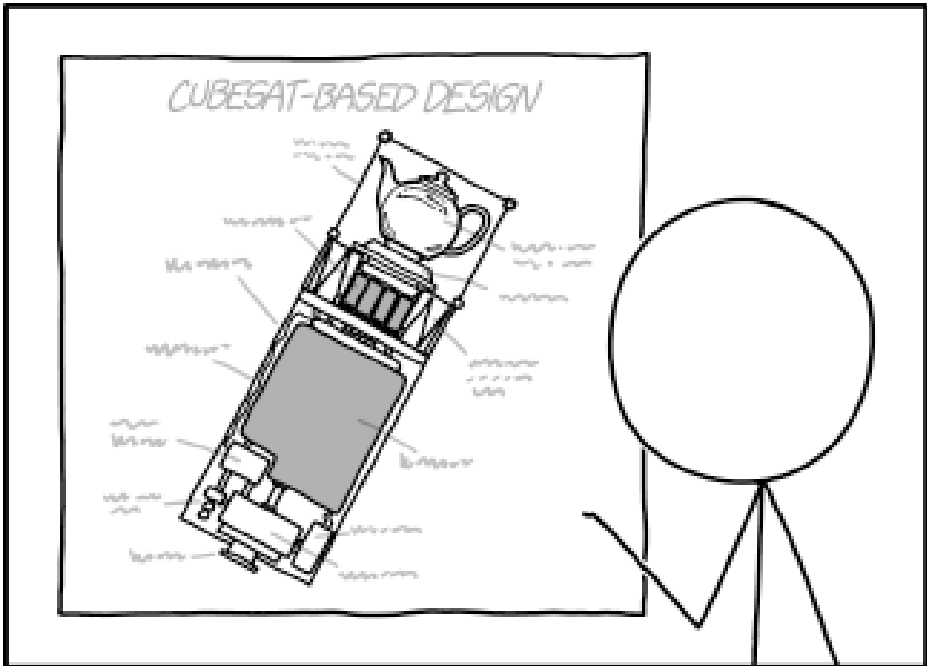
Randall says it is weird from a networking point of view, but in fact modern LTE connections via the cellular network are faster (up to 300 Mbit/s) than the common used Wi-Fi standards like 802.11b/g and 802.11n (54-150 Mbit/s). Faster Wi-Fi standards do exist but they are very rarely supported.

In the title text Randall takes a moment to rail against the often misleading promotional rates offered by cable internet providers. Such providers often attempt to up-sell consumer on internet packages with additional features. Here Randall juxtaposes several descriptors that might feature in a cable ad with several that refer to other things entirely. Xtreme Gigaband is a plausible internet package name, but might also be a reference to Comcast's often derided "Xfinity" promotions. And while Panamax sounds like it may be a film term, it is actually a ship classification that denotes the maximum size ship that can safely pass through the Panama canal. (This could also be referencing the title text of 1632: Palindrome.) Seeing as the title text mentions the cable company, implying that they're also Randall's Internet Service Provider, being "with HBO" would mean including HBO in the cable channel line-up, and most likely include being able to stream TV shows made by HBO. Since HBO shows include Game of Thrones, whose 7th season started only 3 days earlier, it's plausible that this comic might have been inspired by Randall attempting to stream the season premiere. Flavor-Blasted is a food

term often used in hyperbolic television food ad, but also could be a reference to Comcast Cable's "Blast!" internet packages. Pricing mentioned in title text is exaggerated with only \$5 more during first six months, but costing 5 billion after, which is a reference to how service providers would often advertise a lower temporary price, while if you read the fine print the plan is much more costly once the limited time offer runs out, and discounting is simply used for marketing purposes. What's worse, these discounted periods (typically six months) often come with a much longer contract (typically two years) which imposes cancellation fees.

#1866: Russell's Teapot

July 21, 2017



I'M CROWDFUNDING A PROJECT TO LAUNCH A
TEAPOT INTO ORBIT AROUND THE SUN TO SETTLE
THE RUSSELL THING ONCE AND FOR ALL.

Unfortunately, NASA regulations state that Bertrand Russell-related payloads can only be launched within launch vehicles which do not launch themselves.

Explanation

Russell's Teapot is a philosophical argument that reflects on the difficulty of trying to prove a negative. It involves a hypothetical teapot orbiting a heavenly body, whose existence hasn't been proven, and states that it cannot be disproven (somebody put it there secretly?). While an instrument could be theoretically engineered to pick out a teapot-sized object of any luminosity, the teapot would be very easy to confuse for other pieces of space debris, and the space to search is extremely large; the task is thus akin to the proverbial search for a needle in a haystack.

Bertrand Russell devised this analogy "to illustrate that the philosophic burden of proof lies upon a person making unfalsifiable claims, rather than shifting the burden of disproof to others." As such, Russell's teapot is very often used in atheistic arguments.

Cueball is trying to settle the teapot argument by actually launching a teapot into space via a crowdfunding campaign. This misses the point of Russell's argument, which is about unfalsifiable claims in rhetoric and not a literal teapot.

"CubeSat-based design" refers to a type of miniaturized satellites that is made up of 10-centimeter cube units (here seemingly consisting of 3 units) and enables cost-effective means for getting a payload into orbit.

The title-text refers to Russell's paradox, also formulated

by Bertrand Russell. Russell's paradox was a flaw found in naïve set theory where one could consider "the set of all sets that do not contain themselves" (a "set" is a mathematical term for a "group of things" -- "things" in this case including a set itself). The paradox arises with whether this set, in turn, contains itself: if it does, then it cannot; if it doesn't, then it must. Similarly, like in the barber paradox, the vehicle which launches only vehicles which do not launch themselves is impossible: if the vehicle takes off, it must launch itself as well as the teapot, and thus can never be launched (without violating alleged NASA regulations, at least). That said, he might get around those regulations by using an initial first stage with an offboard power source for the moment of launch, for example a laser striking a parabolic mirror and massively heating air beneath the craft, causing expansion, or a compressed gas cold launch system such as used to clear submarine launched missiles from their tubes before the real rocket motor ignites.

The barber paradox can be stated as follows: "Consider a town in which a man, the barber, shaves precisely those men who do not shave themselves. Does the barber shave himself?" Either answer, yes or no, leads to a contradiction. Sometimes the paradox is incorrectly stated, replacing "precisely those" with "only". Under that scenario, there is no paradox; the barber is merely unkempt.

There is, however, a solution in this case. Instead of launching itself, the teapot-containing vehicle may be fired from a space gun, catapult, or other launcher, and

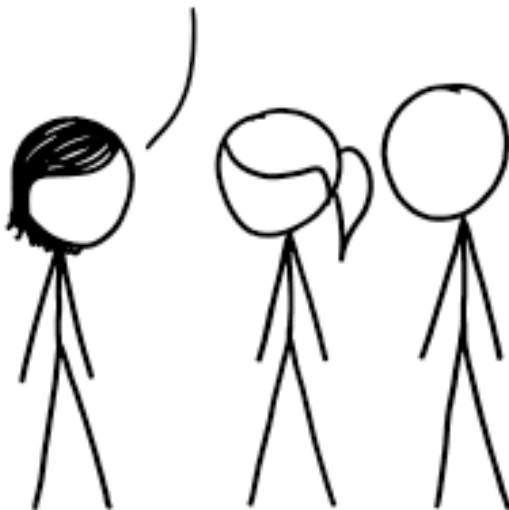
then boost itself the rest of the way. This, while true for the CubeSats themselves, is not true for their carrier.

Randall has talked about CubeSats in later comics as well, specifically in 1992: SafetySat and 2148: Cubesat Launch.

#1867: Physics Confession

July 24, 2017

I'LL BE HONEST: WE PHYSICISTS TALK A BIG GAME ABOUT THE THEORY OF EVERYTHING, BUT THE TRUTH IS, WE DON'T REALLY UNDERSTAND WHY ICE SKATES WORK, HOW SAND FLOWS, OR WHERE THE STATIC CHARGE COMES FROM WHEN YOU RUB YOUR HAIR WITH A BALLOON.



"You know lightning, right? When electric charge builds up in a cloud and then discharges in a giant spark? Ask me why that happens." "Why does tha--" "No clue. We think it's related to the hair thing."

Explanation

A Theory of Everything is a goal of modern physics which would describe the properties of all fundamental particles and all the interactions between them. The current approach to a theory of everything is to describe how at high energies different interactions, such as electromagnetic forces and the strong and weak nuclear interactions merge. It would be possible, in principle to demonstrate how the rest of known physics can be derived from that quantum behavior. This approach, however, leaves many everyday phenomena which are not understood by modern physics, and many arguments against a theory of everything suggest that it won't ever be able to actually precisely describe everything. This comic lists several of those phenomena:

The fine detail of how ice skates work is unknown. It is known that there is a film of water between the skate and the ice that lubricates sliding, but scientists dispute how the film gets there. The commonly held belief is that it is caused by the pressure of the narrow skate; another belief is that the ice is melted by the friction of movement; but both fail to fully explain why skating continues to be possible at temperatures that are significantly below 0 Celsius. A better explanation is simply that, near the melting point of a solid, there will be a thin layer of liquid on the surface due to the dynamic equilibrium between the two phases, hence why ice is slippery. This happens regardless of the presence of skates. A more complete explanation is given in the linked article: Why

is ice slippery?.

Physicists lack a clear understanding of the interactions involved in the flow of granular materials, such as sand. It is known that the behavior diverges greatly from that of a liquid, but it is unknown exactly how the flow works. PhysicsCentral:Granular Materials

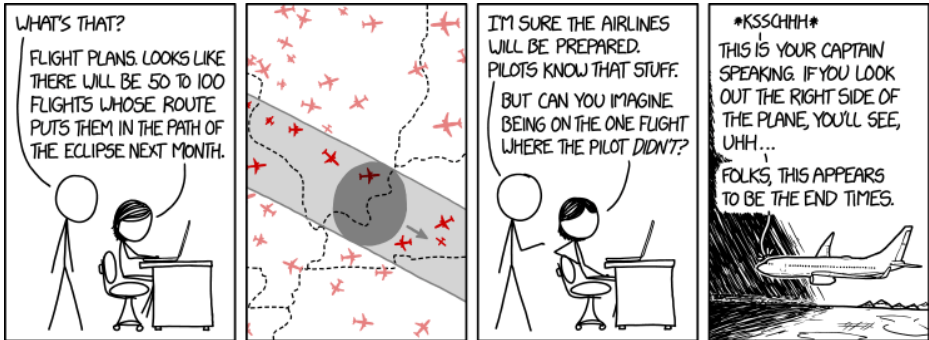
Modern physics also doesn't understand what makes electrons move from one material to another when two materials are rubbed against each other (the triboelectric effect), and why the transfer takes more electrons in one direction than in the other. However, this happens, and it's the cause of static electricity, which can be seen when one rubs a latex rubber balloon against hair.

The title text mentions another common phenomenon that is poorly understood: the separation of charges in a cumulonimbus cloud. It is thought that interactions between ice and water transfer electrons, and then the different motion of ice (as hail) and water droplets in the cloud separates the charge. NOAA How lightning is created.

5 years later, the triboelectric effect was brought up again as an unsolved problem in 2682: Easy Or Hard.

#1868: Eclipse Flights

July 26, 2017



The captain has turned on the 'fasten seat belt' sign.

Explanation

A total solar eclipse occurred on Monday, August 21, 2017, just under a month after this comic was published. It was visible as a total eclipse in a narrow band across the contiguous United States from Oregon on the Pacific coast to South Carolina on the Atlantic. Cueball asks Megan what she is doing, which turns out to be mapping the flights of aircraft that will be flying through the path of totality during the eclipse. She has found between 50 to 100 such flights.

While most flights during the eclipse are coincidental, a few airlines had special flights planned for the occasion. Alaska Airlines, for example, chartered an invitation only flight for about 50 astronomers and serious eclipse chasers.

On the map, the center of the greatest eclipse is shown on the border between Illinois and Kentucky. Cueball says that the airlines and pilots will be prepared and aware of the situation, but Megan wonders what it would be like on a plane with an unprepared crew. The last panel shows a plane flying into the area of the eclipse with one of the crew telling the passengers that the end of the world has come.

In many cultures such as ancient Egypt, the end of the world is represented by a great darkness and the sun going out. During past eclipses, people were said to have believed the world was ending much like this comic

(except without planes). This could also be a reference to 1391: Darkness as in that comic the reporters also believed a natural event to be the world ending although in a different setting.

The title text refers to the 'fasten seat belts' signs on display for the passengers, as a precautionary measure for turbulence. Many pop-culture depictions of the end of the world feature storms, earthquakes, tsunamis, volcanic eruptions, etc; as the captain believes that the end of the world is upon them, he feels it safe to ensure his passengers are prepared for turbulence from any of the phenomena that occur during the end times. However, the precaution of having one's seat belt fastened is vastly insufficient when confronted with such catastrophic events.[citation needed]

This was the first reference to the Eclipse within a month of the totality. It was followed less than three weeks later by 1876: Eclipse Searches. The 2017 eclipse was mentioned as early as 2013 in the title text of 1302: Year in Review. And this year's New Year comic, 1779: 2017, also mentions it. Both comics express concern, in the title text, that it would be canceled/not happen.

#1869: Positive and Negative Reviews

July 28, 2017



PHYSICS TELLS US THAT NEGATIVE REVIEWS
ARE REALLY JUST POSITIVE REVIEWS FROM
PEOPLE TRAVELING BACKWARD IN TIME.

This restaurant is great! I was feeling really sick, but then I ate there and felt better!

Explanation

The comic shows customer reviews from people who purchased a made-up sports drink multi-pack containing twelve 20 oz bottles. The people who gave negative reviews are Merlin (the wizard from the legends of King Arthur) and B. Button (from the short story *The Curious Case of Benjamin Button* and its film adaptation). Merlin remembers the future; in the T. H. White novel series *The Once and Future King*, he was born at the wrong end of time and has to live backwards. Benjamin Button was born with the physical appearance of an old man and grows younger as time progresses. In this comic, they apparently perceive time backwards: Merlin was thirsty then he drank the SmartQuench 9000, but he perceived it as drinking and then becoming thirsty. Benjamin Button was dehydrated then drank 3 bottles and got better, but perceived it the other way around.

Particles of matter can have a positive or negative electric charge. Particles have associated antiparticles with opposite charge. For example electrons are negatively charged particles and their antiparticles are positrons, which are positively charged. Antiparticles can be interpreted as if they were the associated particle moving the opposite direction in time. Applying that interpretation to customer reviews gives the caption of the comic: positive reviews from people traveling backward in time are negative reviews (the "antiparticles" of positive reviews).

The caption says that negative reviews are only positive experiences, but backwards through life. However, Randall also gives an example in the title text of an ostensibly positive review which is actually about a negative experience by a person traveling backward in time (the person ate at a restaurant then got sick). The conclusion is that even the “normal” negative reviews are from backwards versions of positive events, despite the negative version being more common in our world.

#1870: Emoji Movie Reviews

July 31, 2017



There's this idea that emoji are bad for communication because they replace ambiguity and nuance with a limited set of preselected emotions, but it doesn't really survive a collision with real-world usage of the thinking face or

upside-down smiley.

Explanation

This comic discusses reviews of *The Emoji Movie* (previously covered in 1857: *Emoji Movie*) between the cynical, Internet-equipped point of view of Megan and Cueball's language-enthusiasm. They ultimately agree the movie is bad.

The *Emoji Movie* was released to theaters in late July 2017 and received nearly universally-negative reviews. It is particularly notable for having a rating below 10% on the review aggregator site Rotten Tomatoes. Many critics of movie point to superficial problems like the subject matter and the product placement. Here, that train of thought is articulated a bit more, and ultimately it's argued that the real reason the film is bad is because the creators cashed in on a trend without doing any research into it.

When Megan first mentions the movie's negative reviews, Cueball initially accuses the audience of being overly judgmental of the subject matter. He further expresses his fondness for emoji as an interesting and quirky part of language.

Cueball offers an early defense of *The Emoji Movie* by comparing it to *The Lego Movie*, which – despite effectively being an entire movie of product placement for Lego – received generally positive reviews.

They start talking about a "Meh" emoji, who is the main

character of the movie. The idea of "meh" as an emoji is actually ambiguous, as various emoji can be used to describe being unimpressed or neutral towards something. As given in examples from comic those are (U+1F612 Unamused face), (U+1F610 Neutral face) or (U+1F615 Confused face). The selection of a less identifiable emoji for the leading role also contrasts with the fact that the movie also features more iconic emojis.

Megan mentions that one of the attempted jokes in the film is a room full of emojis that are unpopular. Bizarrely, the eggplant emoji (, U+1F346 Aubergine) is featured among them. This is a clear sign that the creative team in charge of this movie had limited first-hand experience with SMS messaging; as any frequent user of emoji will tell you, the is frequently used as a sly stand-in for a penis, due to its similar shape. Cueball's reaction is to ask whether the creators of this film intentionally got this wrong (perhaps as a joke, or active denial of the emoji's common usage because it wouldn't be appropriate for a kid's movie).

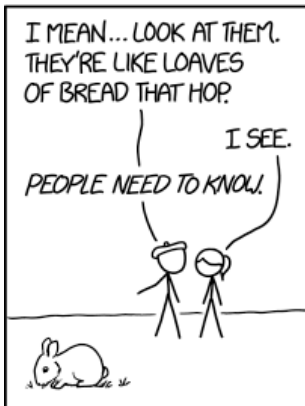
The line from the Wikipedia plot summary was a direct quote from Wikipedia. The sentence was introduced to the article by editor Voicebox64 on July 28, 2017, and the exact phrasing quoted in the comic came from editor SubZeroSilver on July 30. Cueball's response to hearing this line, stating that "it's possible this movie is bad", is likely due to the fact that piracy is the act of obtaining media illegally, generally without paying for it over the internet. This means that there is a very low chance of there being a 'piracy app', as an app such as this would

not be allowed on any online app store. (A few piracy-focused apps do exist, like Popcorn Time, but they are not available in app stores for obvious reasons.) Jailbreak's design in the movie also does not bear a resemblance to hacker-like emojis at the time the movie was released (,) or any existing emoji. (This lack of any existent hacker emoji, however, is addressed in the movie; when pressed on the topic, Jailbreak is revealed to be the princess emoji in disguise.) Furthermore, the blatant product placement of the protagonists' desires to use Dropbox, the proprietary software of a for-profit company, is the final nail in the movie's coffin in Cueball's opinion. The fact that Jailbreak's plans to live 'in the cloud' superficially match with Dropbox's cloud storage service does not salvage the concept.

The title text is an argument against the common prediction that emojis would lead to less nuanced communication, and as evidence it cites the thinking face emoji (🤔) and upside-down smiley (🙃), both of which are used in ways that have developed difficult-to-define nuances and meanings. In the first case, the thinking-face emoji is often used sarcastically -- for example, feigning confusion when presented with contradictory/hypocritical statements from the same source. The upside-down smiley also has specific usage, indicating a tone of silliness or even insanity, and is also often used sarcastically, such as when reacting to bad news.

#1871: Bun Alert

August 02, 2017



Since buns range from crepuscular to nocturnal, it's recommended that you enable the scheduled "Do Not Disturb" mode on your phone to avoid being woken by alerts about Night Buns.

Explanation

The comic opens with Beret Guy identifying a "bun", an informal term for a rabbit also used in 1682: Bun. The title text of that former comic specifically refers to sending out a "BUN ALERT" to friends and family with location and photographic evidence of the bun, so in this comic, that concept appears to have been elevated from a simple mass SMS/MMS message to a standalone application.

Upon seeing the bun, Beret Guy uses his phone to send an alert about the "Bun" with a push notification. He is still looking for investors, though such an app would likely not appeal to a wide market.[citation needed] In response to Ponytail's confusion, he explains that bunnies are "like loaves of bread that hop" making a pun by comparing rabbits to bread, as "bun" can commonly refer to a small loaf of bread. Beret Guy is known to be fascinated with bakeries, as shown in the comics 434: xkcd Goes to the Airport, 442: xkcd Loves the Discovery Channel , or 452: Mission, so it makes sense that this sort of comparison occurs to him. It is known that the word "bun" is similar to the word "pun". Beret Guy has a history of misinterpreting statements and phrases (and often making said misinterpretations correct through some strange power of his), so it is not implausible that he actually genuinely thinks that these "buns" are bread products that somehow behave exactly like rabbits.

As Ponytail leaves, apparently to remove herself from the

situation, Megan hurriedly approaches, excited to see the "bun". This serves as a punchline as, despite Ponytail appearing to be the voice of reason, it seems that Beret Guy's inane bun alert system has gathered a dedicated following after all.

Megan's question "Is it small?" and her amazement when she finds out that it is parallels the idea in 1682: Bun where the bun's size is said to be inversely correlated with its status; smaller buns such as the one in this comic are thought of as higher-ranking "king buns" by the characters in both strips. In real life, smaller rabbits are more likely to simply be young. It is also possible that she simply thinks smaller buns are cuter, which might have been the motivation for the whole bun-ranking system thing in the first place.

The title text refers to buns being crepuscular and nocturnal animals, meaning they are primarily active at twilight and night, respectively. This means that someone with the app would get a lot of notifications while they would most likely be asleep. Many smartphones have a "Do Not Disturb" mode that can be activated so that only select communications (i.e. direct calls) will actually set off the ringer/vibration, and all others will simply be added to the device's notification queue; such a function can be scheduled to automatically activate during the period when the user is asleep. The title text unironically points out a prime example of the need for such a function: if something is likely to notify your device late at night, then you should make sure that those notifications are silenced by the Do Not Disturb

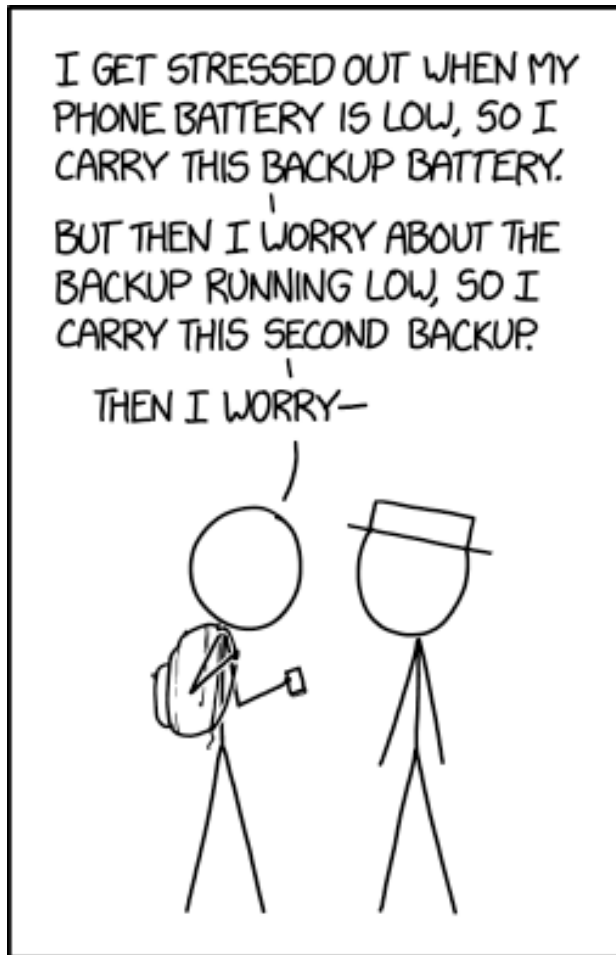
function.

The bun alert reappears in 1903: Bun Trend, where Beret Guy receives the alert.

After this comic was posted, someone has created a Bun Alert website and app. It does exactly what Randall's portrayed Bun Alert app describes.

#1872: Backup Batteries

August 04, 2017



MY BAG IS 90% BACKUP BATTERIES.

If it falls below 20% full, my bag turns red and I start to panic.

Explanation

Most smartphones (except iPhones and a few others) use replaceable batteries. So it's often possible to buy additional batteries and use them as a backup in case there is no external power source available to recharge the phone. Otherwise it's possible to buy a charging device (also with batteries) that could be connected via cable to the phone to recharge the internal battery. Since there is no cable in the comic picture Cueball probably shows a battery that could replace an empty one in the phone.

Cueball gets stressed when his phone is at low battery because the device may run out at any moment, interrupting his activities. In an effort to prevent stress, Cueball decides to carry a backup battery so he can just replace the current battery when it runs low. Cueball realizes that the backup battery itself is prone to depletion, and so he carries a second. He then comes to the same realization for the second backup battery, and indeed every subsequent battery he can carry. Finally this would lead to an unending series of backup batteries, hence his speech is cut off, becoming unending as well.

What Cueball never grasps is that his irrational need to hoard a supply of batteries tending to the infinite is the real cause of his stress. In reality, he only needs to consider the maximum amount of time that he spends between recharging his phone, and divide that by the average lifespan of a phone battery, and round up that figure to get the minimum number of batteries required

to avoid a power outage (multiplied by 1.5 if the mere state of running low causes stress). If he charges up his phone and backup batteries every night, he would only need 2 to 3 backup batteries, tops.

The title text says that Cueball's backpack will turn red if it is less than 20% of it is filled with batteries, similar to the battery indicator on a smartphone when at low battery to warn the user. Cueball probably gets similarly stressed when that happens, perhaps requiring a backup backup-battery backpack. Most backpacks do not have this function.[citation needed] It is unclear by what mechanism the backpack turns red or detects that it should do so.

That Randall has issues with low battery power on cell phones can be seen in the earlier comics 1373: Screenshot and 1802: Phone and in the later comics 1965: Background Apps and 2680: Battery Life.

#1873: Email Reply

August 07, 2017

DEAR KEVIN,

I'M SORRY IT'S TAKEN ME TWO YEARS TO REPLY TO YOUR EMAIL. I'VE BUILT UP SO MUCH STRESS AND ANXIETY AROUND MY EMAIL INBOX; IT'S AN UNHEALTHY DYNAMIC WHICH IS MORE PSYCHOLOGICAL THAN TECHNICAL. I'VE TRIED ONE MAGICAL SOLUTION AFTER ANOTHER, AND AS EACH ONE HAS FAILED, DEEP DOWN I'VE GROWN MORE CERTAIN THAT THE PROBLEM ISN'T EMAIL — IT'S ME.

REGARDLESS, THESE ARE MY ISSUES, NOT YOURS; YOU'RE MY FRIEND, AND I OWE YOU THE BASIC COURTESY OF A RESPONSE. I APOLOGIZE FOR MY NEGLECT, AND I HOPE YOU HAVEN'T BEEN TOO HURT BY MY FAILURE TO REPLY.

ANYWAY, I APPRECIATE YOUR INVITATION TO JOIN YOUR PROFESSIONAL NETWORK ON LINKEDIN, BUT I'M AFRAID I MUST DECLINE...



I would be honored, but I know I don't belong in your network. The person you invited was someone who had not yet inflicted this two-year ordeal upon you. I'm no longer that person.

Explanation

Cueball is sitting at his desk writing an email. He is responding to Kevin, who sent him an email two years ago. Cueball is so far behind in responding to his email, he goes to great lengths to apologize for it. Instead of blaming the email culture which creates enormous quantities of messages, he blames himself for not keeping up. Failing to answer emails is a common symptom of general anxiety disorder, a problem which can snowball out of control as more and more emails go unread or unanswered.

At this point in the email, the reader assumes that Kevin's message really demanded a faster response, being personal and timely. Then Cueball reveals that the email is just the ubiquitous LinkedIn invitation. LinkedIn is a professional networking site notorious for inundating its users with emails inviting them to connect to other users (frequently people the user has little-to-no connection to), as well as any email contacts of their users whether or not they actually belong to LinkedIn themselves. Thus, an invitation to connect to LinkedIn is most often immediately deleted or ignored. A less socially anxious person who understands the irrelevance of such an email would not worry about failing to respond to such a request at all, and certainly would not pour his heart out in apology for failing to reply.

The title text makes Cueball's overinvestment in the email even more exaggerated, suggesting that Cueball is

rejecting the invitation not because of its pointlessness, but because he feels that as a bad friend who doesn't respond to emails, he is no longer even worthy of it.

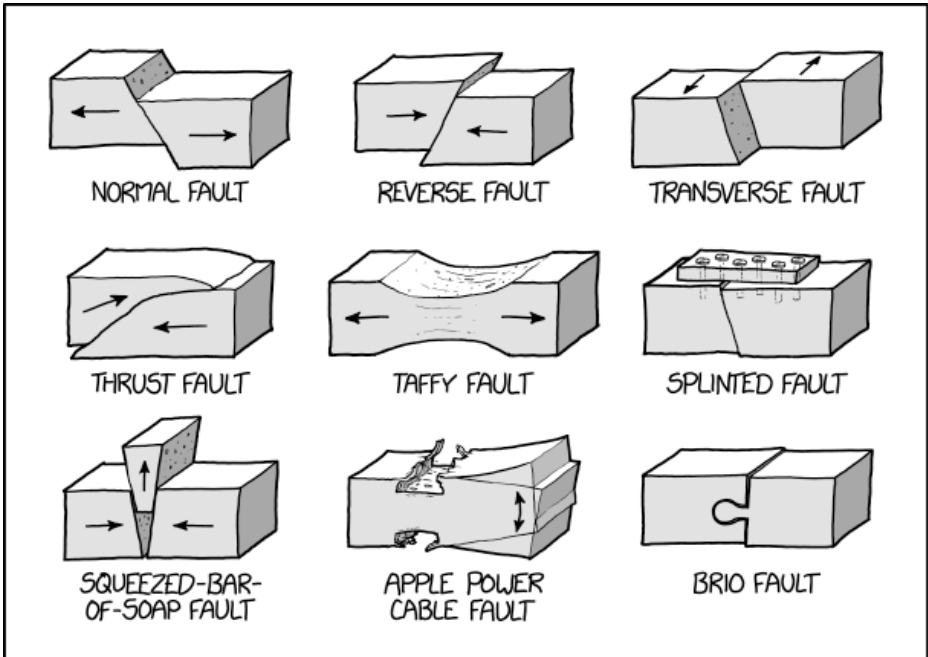
One could interpret the letter as a passive-aggressive lashing out, but that does not seem to be in character for Cueball. Had the character worn a Black Hat though...

Cueball's difficulty in checking his email was previously addressed in 1783: Emails (trivia: the comic numbers 1783 and 1873 are anagrammatic).

This is the fourth comic within a year where Randall uses "Kevin" as a go-to-name, although it was half a year since last time in 1795: All You Can Eat. See details in that comic's trivia.

#1874: Geologic Faults

August 09, 2017



I live on a
torn-bag-of-potato-chips-where-the-tear-is-rapidly-growin
g fault, which is terrifying.

Explanation

This comic appears to be a successor to 1714: Volcano Types. Similar to its predecessor, the comic explores several phenomena (in this case, geologic faults), both real, and several made up for the point of a joke.

A fault is a geologic feature involving a planar fracture with displacement in a large mass of rock, including the boundaries of two tectonic plates.

Real geologic faults[edit]

In a normal fault, the hanging wall (the lower wall; right) moves downward relative to the footwall (the upper wall; left). The Earth's crust is extended in this type of fault.

A reverse fault is basically the opposite of a normal fault. The hanging wall (left) moves upward relative to the footwall (right), and the Earth's crust is compressed.

A transverse fault, also known as a transform fault, is where the two plates move parallel to each other, but in opposite directions.

A thrust fault is when older rocks are pushed (or thrust) on top of younger rocks. The angles are typically lower (more horizontal) than in reverse faults.

Fictional faults[edit]

This appears to involve one tectonic plate, that is being stretched out like a piece of taffy. Ductile crustal thinning of this type actually occurs in rocks under tension at sufficient depths. Such

deformation is not a fault, however, as there is no fracture along which movement takes place.

This appears to be a normal or reverse fault that someone has attempted to fix in position by attaching a large splint, as you might with a broken bone. This is unlikely to prove effective.[citation needed]

Two plates seem to be moving towards each other, while a third smaller plate is squeezed between them and pushed upwards, much as a slippery bar of soap might pop up when squeezed between two hands.

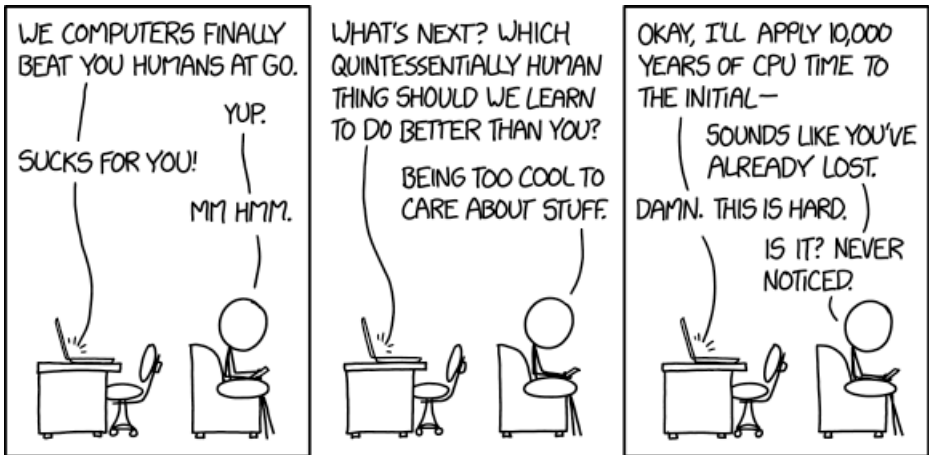
The plate appears to have been twisted and bent so many times that parts of it are fraying and the end is splitting apart, similar to a damaged Apple MagSafe connector.

BRIO is a company from Sweden that makes wooden toys, including train sets. The Brio fault seems to be two tectonic plates which join together like the Brio train track pieces do. (However, this join is obviously incorrect because of the height difference.)

The title text refers to when a bag of chips gets a tear in it. When this happens, any further stress on the bag, such as reaching in to get more chips, can easily increase the size of the tear, sometimes very quickly. It would be frightening to live near a fault that behaved like this[citation needed] because it could cause major seismic events very quickly. If you were close enough to the fault, you might be afraid that the crack would grow underneath you, causing you to fall into the bag of chips — or, rather, the Earth.

#1875: Computers vs Humans

August 11, 2017



It's hard to train deep learning algorithms when most of the positive feedback they get is sarcastic.

Explanation

Cueball's laptop smugly crows to its owner about how computers have proven their intellectual superiority over humans yet again. In May 2017, a Google artificial intelligence beat the world's best Go player at the game. Go is a very complex and deep board game, so this could seem alarming to a person concerned about competing with computers.

However, Cueball seems too focused on his book or phone to care. He remains nonchalant in the face of this news, and suggests that computers learn next to become "too cool to care about stuff" themselves. The computer gets to work preparing to outdo humans at not caring. However, by expending the physical effort to set up the algorithm, it proves that it cares about reaching this goal, a contradiction that Cueball points out. Cueball further rubs it in by coolly stating that he doesn't even have to try to act the way he acts – much like a wide range of everyday human behaviors, such as moving around, or recognizing objects in images, require very little conscious effort, while being quite hard for machines to emulate.

Relative strengths of human versus computer go players was previously mentioned in 1263: Reassuring. This comic also presents something that looks like a reassuring parable (something humans can do which computers are not yet able to do). An irony here is that, unlike in the cartoon, it is very easy to make a computer not care about

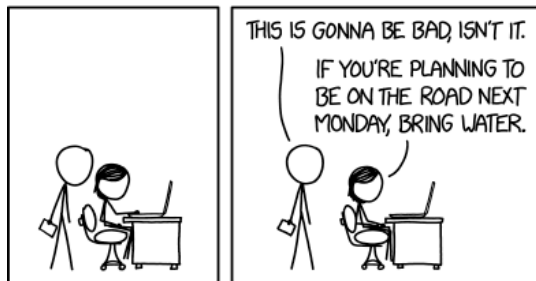
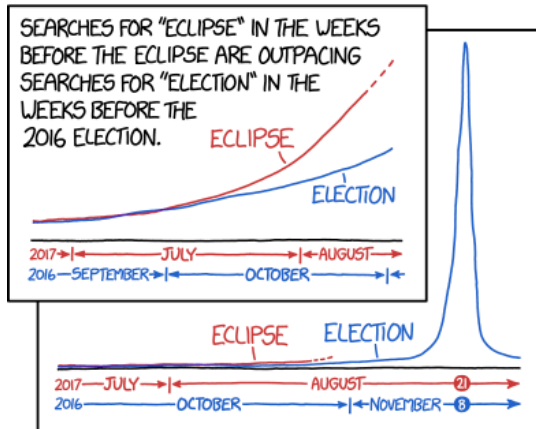
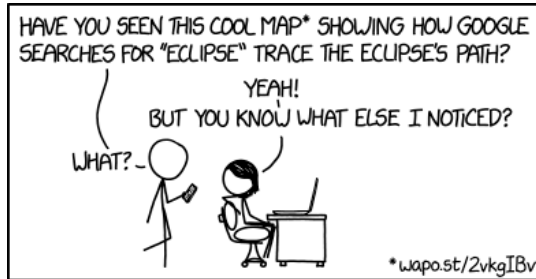
something. It is making it care about anything that would be quite difficult.

The title text elaborates on the hypothetical paradox of computers trying not to care about stuff. Neural network programs are developed by training them with sample inputs and the desired output. When the end goal is not to care, that is, that the output is unaffected by this input, then any examples where the output did depend on the input would be sarcasm: the use of irony to mock or to convey contempt.

Randall already noticed that computers would soon beat humans in Go back in 2012 in the comic 1002: Game AIs and a year later the event is so close that it became the main topic of 1263: Reassuring. The present comic could almost be seen as a continuation of Reassuring.

#1876: Eclipse Searches

August 14, 2017



There were traffic jams for the eclipses in 1970 and 1979, and that was **before** we had the potential for overnight viral social media frenzies.

Explanation

This comic is the first of five consecutive comics published in the week before and during the solar eclipse occurring on Monday, August 21, 2017 which was visible as a total solar eclipse within a band across the contiguous United States from west to east and visible as a partial eclipse across the entire contiguous United States and beyond. The other comics are 1877: Eclipse Science, 1878: Earth Orbital Diagram, 1879: Eclipse Birds, and 1880: Eclipse Review.

Cueball comes to tell Megan about a cool map showing that searches on Google on the word Eclipse trace the same path across the USA as the totality band does, implying that those living in the zone are more interested than the rest of the US population.

The "cool map" is hosted by The Washington Post and sourced from Google Trends data. The link shown in the comic is here: wapo.st/2vkgIBv (subscription required); an archived version is available here at archive.org

Since the eclipse searches are outpacing the 2016 election searches now, this is saying the eclipse popularity is going to rocket upwards just before the eclipse. Cueball is thus warned by Megan that the extreme amount of social media interest in the eclipse may lead to massive traffic jams, as last days frenzy regarding the eclipse will cause an enormous amount of people to decide to go to the eclipse in the last moment, causing huge traffic jams.

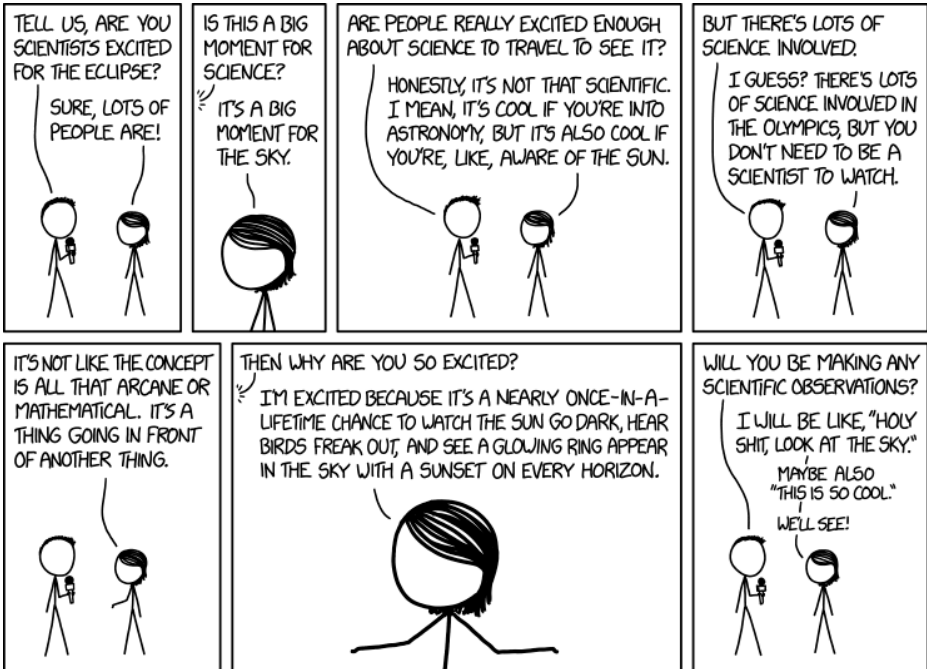
(These traffic jams may be analogous to long lines at the polls or traffic jams caused by people trying to get to the polls.) Also as soon as people driving on the freeway enters the totality zone it has been seen happening that people just stop their cars and get out blocking the roads. This time also the eclipse-viewers will wish to post their content on the social media which might also cause a cyber traffic jam, in which users may find that they experience delays in sending or receiving data due to a high demand on telecommunications infrastructure. Megan tells Cueball to bring water if he is on the road during the totality, the implication being that people who are on the road may be stuck in their vehicles for long periods of time, and thus need refreshments.

In the graph charting interest in the 2016 US presidential election, November 8 is an important date as it was the day the election was held. August 21, 2017 refers to the date of the then upcoming solar eclipse.

The title text refers to the total eclipses from 1970 and 1979 which were also visible in the US, but both only for a few states. The traffic jams will be worse than those caused by previous eclipses, as we did not have viral social media in the 1970s, and also much less traffic on the roads.

#1877: Eclipse Science

August 16, 2017



I was thinking of observing stars to verify Einstein's theory of relativity again, but I gotta say, that thing is looking pretty solid at this point.

Explanation

This comic is the second of five consecutive comics published in the week before and during the solar eclipse occurring on Monday, August 21, 2017 which was visible as a total solar eclipse within a band across the contiguous United States from west to east and visible as a partial eclipse across the entire contiguous United States and beyond. The other comics are 1876: Eclipse Searches, 1878: Earth Orbital Diagram, 1879: Eclipse Birds, and 1880: Eclipse Review.

This comic reflects on various reasons scientists have for being interested in a total solar eclipse. An eclipse is an astronomical event, which most laypeople associate with science and thus might assume would be of interest to scientists. However, when the reporter probes Megan on scientific interest on the eclipse, Megan gives short and sarcastic answers, downplaying any experimental significance of the phenomenon and indicating that her only interest is in spectacle rather than science. She also makes the point that science is no more involved in an eclipse than any other spectator event, and does not work to observe phenomena without any interest in discovery. Eclipses are well-understood events and there is no lack of models for explaining the physics behind them; the alignment of bodies in space is a result of orbital mechanics which are present at all times, making the whole event only significant to the observer.

While some astronomers might be testing elaborate

hypotheses during an eclipse, for other scientists (e.g. organic chemists and paleontologists) it is just a once in a long time (maybe even once in a lifetime) event which is visually interesting. Some biologists may, however, be collecting data on the behavior of animals during an eclipse, which is poorly understood due to its rarity.

Megan's point is that in 2017 (and for several decades/centuries previous) eclipses are thoroughly understood. Wikipedia has a listing of every eclipse that will occur in the 21st Century, to include the coordinates and time of greatest eclipse. While eclipses offer a unique opportunity for ground based observation of the Sun's outer layers the majority of the study of the sun is done by satellites that do not require an eclipse to take readings.

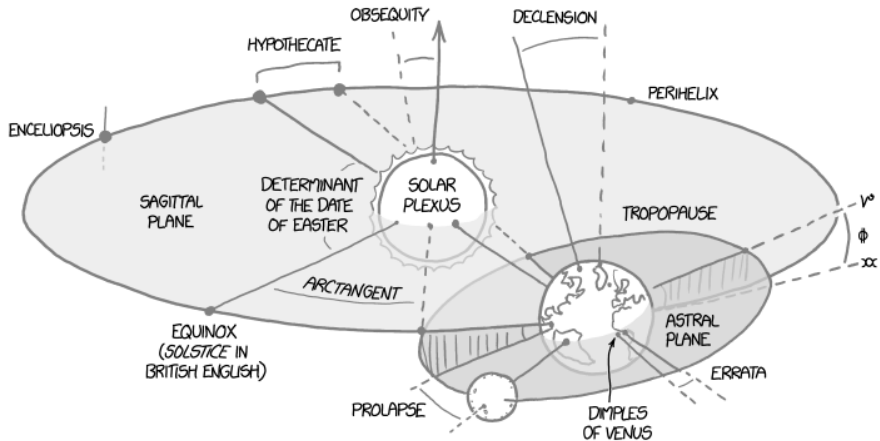
The title text refers to a 1919 experiment during an eclipse to observe gravitational deflection of light waves. The 1919 experiment was the first strong experimental confirmation of Einstein's then-new theory. One century later, general relativity has been tested and confirmed in so many different ways that pretty solid is a vast understatement.

#1878: Earth Orbital Diagram

August 18, 2017

WHY ISN'T THERE AN ECLIPSE EVERY MONTH?

THIS IS A COMMON QUESTION! THE ANSWER IS MADE CLEAR
BY A QUICK LOOK AT THE EARTH'S ORBITAL DIAGRAM:



You shouldn't look directly at a partial eclipse because of the damage that can be caused by improperly aligning the solar-lunar orbital plane with the orbital bones around your eye.

Explanation

This comic is the third of five consecutive comics published in the week before and during the solar eclipse occurring on Monday, August 21, 2017 which was visible as a total solar eclipse within a band across the contiguous United States from west to east and visible as a partial eclipse across the entire contiguous United States and beyond. The other comics are 1876: Eclipse Searches, 1877: Eclipse Science, 1879: Eclipse Birds, and 1880: Eclipse Review.

The comic claims that the reason that eclipses don't happen every month is simple to understand by looking at an orbital diagram. Ironically, the cartoon has so many parts and labels that it is far more difficult to understand than is implied. While the graph itself is based on astronomical definitions, all the labels are nonsense in this context. In effect, the comic is a new take on a common joke in which a person asks a scientist a question, the scientist begins by saying "It's really quite simple", then proceeds to give a very lengthy and highly technical explanation that non-scientists would not be expected to understand. Diagrams for eclipses commonly include things that laypeople may not find relevant, without explanation, such as the umbra and penumbra.

All of the labels in the diagram are complicated words or phrases. Some are related to orbital mechanics (e.g. "equinox" and "perihelion"), while others are wholly unrelated or even made up. Each label is nonsensical in

its place in the diagram. Compare/contrast with the standard Kepler Orbit diagram.

The title text references warnings to not look directly into the sun, but parodies those warnings by referring to 'orbit', the anatomical term for the eye socket.

Labels and Their Astronomical Meanings[edit]

All items are not drawn to scale. Neither the sizes of the celestial objects are that similar as shown nor the orbits are. The real scales are shown in this table:

When the distance Sun-Earth is scaled to one meter or below neither Moon nor Earth can be seen by the human eye.

- Arctangent is the inverse function of the tangent function of trigonometry. You can determine a non-right angle of a right triangle by taking the arctangent of the length of the opposite side divided by the length of the adjacent side.
- The angle shown in the comic has no astronomical meaning.
- The Astral plane is a plane of existence in various esoteric theories. It features prominently in Dungeons & Dragons cosmology, connecting the various other planes of existence.
- The picture shows the lunar orbital plane, the plane in which the Moon orbits the Earth, tilted about 5.1 degrees from the ecliptic.
- Declension is the inflection of nouns in a language. In Latin declension and declination are both called Declinatio. In this comic, however, it might be a portmanteau of declination and (right) ascension.

- In astronomy, the declination is one of the two angles that locate a point on the celestial sphere in the equatorial coordinate system. It is measured north or south of the celestial equator, like the geographical latitude on Earth. But in the picture the label is at the angle for the axial tilt of the Earth.
- And the right ascension is the angular distance measured eastward along the celestial equator from the vernal equinox to the hour circle of the point in question.
- In Western Christianity Easter always falls on the first Sunday after the first ecclesiastical full moon after the beginning of spring (equinox). The ecclesiastical full moon is determined by a calendar that approximates the actual time of the full moon, Thus the date of easter is defined by a combination of a solar and a lunar calendar. The position of that angle isn't that bad but it should be not more than 30 degrees (slightly more than one lunar month.)
- In mathematics, the determinant is a function of numerical matrices. In this context, however, it apparently refers to something that directly determines the date of Easter.
- The Dimples of Venus are indentations sometimes visible on the human lower back.
- In astronomy the Belt of Venus is a shadow cast by the Earth visible in its atmosphere.
- Enceliopsis is a small genus of flowering plants in the daisy family, appropriately known as "sunrays".
- The element "encel-" might also be a reference to Enceladus, a moon around Saturn.
- The elements "-elio-" and "-psis" are also found in many technical orbital terms such as aphelion, perihelion, apsis,

apoapsis and periapsis. See apsis.

- The point depicted on the diagram has no specific meaning.

Equinox and Solstice have very different meanings:

- An Equinox is one of two instants in the year when the sun is exactly over the equator; the length of day and night are very nearly equal that day at all locations on the planet, and it is potentially the first day of Spring or Autumn, depending on the time of year, in which hemisphere (Northern vs Southern) the observer is located, and which definition of seasons one uses.
- A Solstice is one of two instants in the year when the sun's angle is maximally far from Earth's equator; when one occurs, the length of the day or night is shortest or longest (depending on whether one is in the northern or southern hemisphere), and (in the United States) it marks the first day of summer or winter.

Both types occur because the Earth's rotation axis is tilted (at 23.4 degrees) from its orbital plane (ecliptic) about the Sun.

Jokingly insisting that two different terms are American/British variants of the same word has been the topic of 1677: Contrails.

- Hypothecate is a legal verb that means something similar to "make a mortgage".
- The hypotenuse is the longest side of a right-angled triangle. Here it is an unrelated length, approximately equal to the diameter of the sun (half the angular size of the sun times twice the distance to it).
- Obsequy means the state of being obsequious (showing an indecorous willingness to obey or serve, or "sucking up").

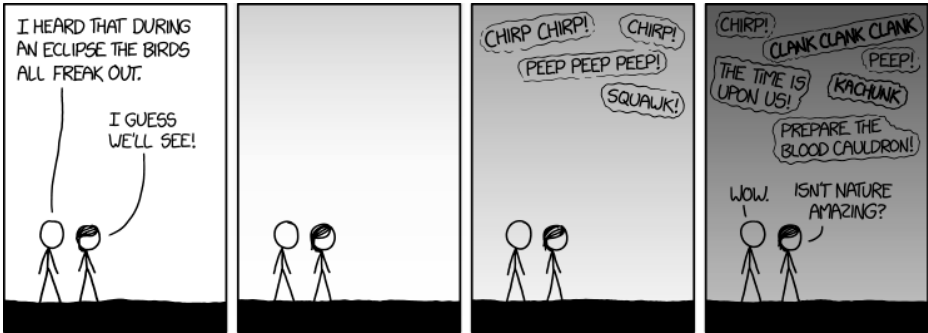
- In astronomy the correct word is Obliquity, meaning an axial tilt.
- This is a portmanteau of helix and perihelion.
- The perihelion is the point in a elliptical solar orbit that is closest to the Sun.
- A Prolapse is a medical condition in which an internal organ is slipped forward or down.
- The word might be a reference to the apoapsis, which is the point of a body's elliptical orbit about the system's centre of mass where the distance between the body and the centre of mass is at its maximum. The periapsis is the point where the distance between the body and the centre of mass is at its minimum. In the specific case of the Moon's orbit, these points are called apogee and perigee. On the diagram, the prolapse is not shown as a point, but as an angle of the Moon's orbit.
- Retrograde and prograde motion are terms used to describe the apparent motion of celestial objects through the sky.
- The Sagittal plane is an anatomical plane, dividing the body in left and right.
- The correct label in the picture would be the Ecliptic plane. The plane the Earth orbits the Sun.
- Sagittarius is one of the stellar constellations of the Zodiac. The center of the Milky Way lies in this constellation.
- The Solar plexus is a network of nerves located in the abdomen. It was the name of 64: Solar Plexus.
- Solar is an adjective referring to the Sun, the star in our solar system.
- The Tropopause is the boundary in our atmosphere between

the troposphere and stratosphere, defined as the boundary where air ceases to cool with increasing elevation. It is 9-17 km above sea level, not the thousands of kilometers as depicted here.

- The label appears to point at the orbit of the moon.
- The angle depicted is the inclination of the moon orbit. The planes are marked with nonexistent symbols, derived from Greek letters. The lunar orbit plane is labeled by a mixture of a nu (ν) and a gamma (γ), the ecliptic is labeled with a double chi (χ), and the angle between is marked with a phi (ϕ) but having two vertical lines.
- Errata are corrections in a published text (e.g. a newspaper article) issued after the publication.
- The word might be a reference the words aberration, eccentricity or anomaly, which all have both a technical astronomical definition and a common definition meaning "something wrong or strange". Of the three, the term "aberration" is the closest looking to "errata", but, unlike eccentricity and anomaly, it is not the name of an orbital parameter.
- The angle depicted lies between the direction from Earth to the Sun in the ecliptic and the line where the lunar orbit plane crosses the ecliptic. When this angle would be zero AND the Moon is between the Sun and Earth a total eclipse would occur. This is they only part of the diagram fulfilling slightly Randall's promise on top of the picture.

#1879: Eclipse Birds

August 21, 2017



'Hey! Put her down!' 'No, it's ok! The next chance for me to be carried to a blood cauldron isn't until 2024!'

Explanation

This comic is the fourth of five consecutive comics published in the week before and during the solar eclipse occurring on Monday, August 21, 2017 which was visible as a total solar eclipse within a band across the contiguous United States from west to east and visible as a partial eclipse across the entire contiguous United States and beyond. The other comics are 1876: Eclipse Searches, 1877: Eclipse Science, 1878: Earth Orbital Diagram, and 1880: Eclipse Review.

During an eclipse, birds and other animals show atypical behavior like they do in the case of the darkness in the night and the following sunrise. Birds stop singing during totality, then greet the return of the sun with a "dawn chorus". Owls, however, become active as do mosquitoes. But it's not easy to find studies about this behavior because the main focus lies mostly on the eclipse itself. And total solar eclipses are rare -- roughly every 18 months and then mostly not in the same region of this world. A nice article can be found here: Effects of the 2001 total solar eclipse on African wildlife. Hippos were so confused that their daily routine even on the next day was not back to normal. Baboons stopped feeding and a sun squirrel that fed in the afternoons didn't do so, while other larger animals like crocodiles, zebras, or lions were not affected. Butterflies settled and did not restart flying, mosquitoes appeared and settled before reappearing in the evening. Also, bees moved into a hive and didn't come out until the next morning.

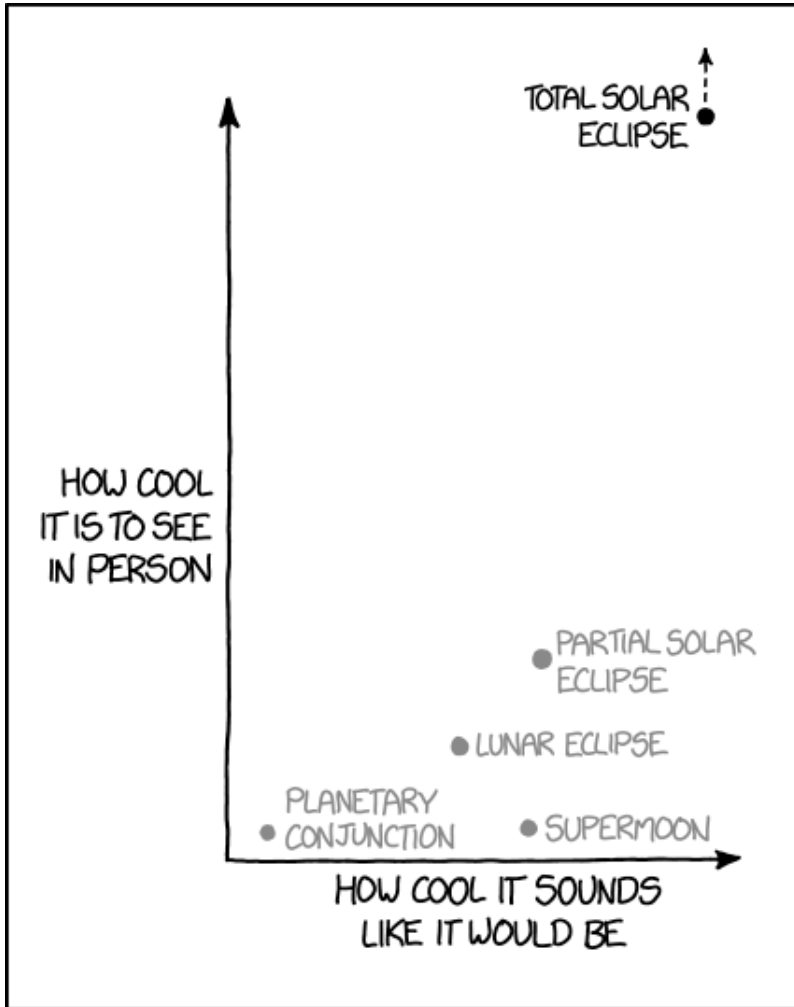
After the 2017 eclipse, NASA published some highlights. A video presents chirping crickets in Jefferson City, Missouri. The California Academy of Sciences supports a citizen science project about life responds.

In this comic, Cueball tells Megan that this will happen. However, instead of just cheeping and screeching in a different pattern than birds actually do during an eclipse, in the comic, the birds begin to prepare to make a sacrifice to appease their gods, similar to how ancient cultures like the Aztecs are said to have acted. Megan remains strangely nonchalant, offering only a clichéd admiration of nature as the birds around her use fluent English to set up a sacrificial ritual.

In the title text, it turns out that the birds are about to sacrifice Megan, and Cueball tells them to stop. But Megan tells him it is OK as she wants to try experiencing being carried to a blood cauldron as she won't get another chance until the next eclipse in the US on 8th of April, 2024. (A small region around Carbondale, Illinois will experience two total eclipses in 7 years).

#1880: Eclipse Review

August 23, 2017



I watched from a beautiful nature reserve in central Missouri, and it was--without exaggeration--the coolest thing I've ever seen.

Explanation

This comic is the last of five consecutive comics published in the week before and during the solar eclipse occurring on Monday, August 21, 2017 which was visible as a total solar eclipse within a band across the contiguous United States from west to east and visible as a partial eclipse across the entire contiguous United States and beyond. The other comics are 1876: Eclipse Searches, 1877: Eclipse Science, 1878: Earth Orbital Diagram, and 1879: Eclipse Birds.

The comic is another comparison graph, like 1775: Things You Learn or 1701: Speed and Danger. It contrasts how cool something sounds and how cool it actually is. It has five points on it, planetary conjunction, supermoon, lunar eclipse, partial solar eclipse, and total solar eclipse.

While the four other things than total solar eclipse are relatively close to each other on the "how cool to see" scale, the graph is not even high enough to plot the total solar eclipse point as indicated by the dotted arrow showing that this point should be way higher up. This is as opposed to leaving the point out, as Randall did with the coconut in 388: Fuck Grapefruit, where it is only mentioned in the title text. This could be an indication that if the scale had been high enough to fit the total solar eclipse point, then the rest of the points would be on the x-axis without any indication of which would be cooler.

A total solar eclipse correctly sounds like it is the coolest of the five, but it is vastly cooler to see it in person by a wide margin. It seems like Randall is trying to convince those who missed the eclipse this time to go watch in seven years when another total solar eclipse is visible in the USA.

In a planetary conjunction two or more planets are visible close together in the night sky. This happens relatively often because all planets lie in roughly the same plane around the sun (the Sagittal ecliptic). This looks like two big stars close to each other, and isn't particularly exciting.

A supermoon is a full moon or a new moon that approximately coincides with the Moon's closest approach in its elliptic orbit around the Earth. This results in a larger-than-usual apparent size of the lunar disk, but a typical human doesn't recognize the difference. Nevertheless, in recent years the press has often announced supermoons as important astronomical events. The opposite of a supermoon is called a micromoon. A "supermoon" sounds very cool, but like a planetary conjunction it's almost indistinguishable in the average night sky (see 1394: Superm*n, and this list) of other comics that have referred to the term).

A lunar eclipse occurs during the full moon and, like at a solar eclipse, happens only when the Moon is in the region where the orbital planes of the Moon and the Earth intersect. The Earth's shadow falls on the Moon, causing it to appear dark red. The moon doesn't generally

darken completely due to some light still reaching the Moon through the outer layers of the Earth's atmosphere. As with solar eclipses, lunar eclipses occur on average once every six months, but they can be viewed by anyone who is on the night-time side of Earth during the eclipse, as opposed to only being visible from a small strip of the Earth's surface. A lunar eclipse looks noticeably different from a usual full moon, making it fairly cool.

There are three types of non-total solar eclipses. A partial eclipse occurs when the Sun and Moon are not exactly in line with an observer on Earth, and thus the Moon doesn't fully obscure the Sun. An annular eclipse occurs when the Sun and Moon do line up with an observer on Earth, but the Moon is too far away from earth to block the entire Sun. The Sun appears as a very bright ring, which is also called an annulus. A hybrid eclipse is an eclipse which is total when viewed from some parts of the earth, but is annular when viewed from others. These mixed eclipses are comparatively rare, even when compared with total eclipses. A large percentage of the continental United States experienced a partial eclipse along with the total solar eclipse on August 21st. A partial solar eclipse is quite cool, but nowhere near as dramatic as a sky-darkening total solar eclipse.

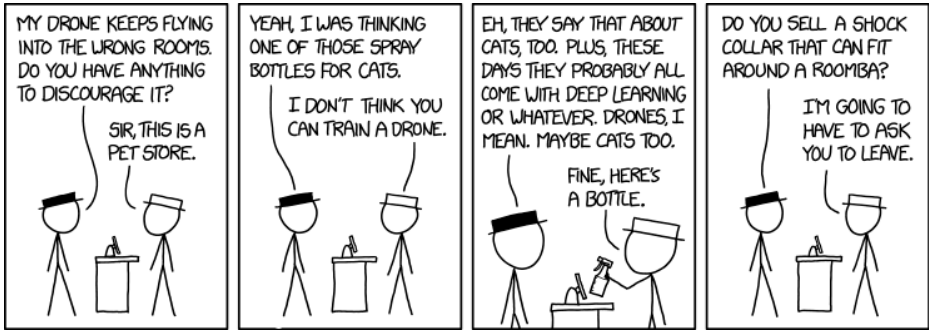
The total solar eclipse is the topic of this and the four preceding comics. It occurs during the new moon, and happens only when the Sun and Moon are exactly in line with an observer on Earth and when the Moon appears large enough to fully obscure the Sun. Unlike a lunar

eclipse, only a small portion of the Earth lies within the Moon's shadow at any given time, roughly a disc with a diameter of approx. 100 km. The disc moves very fast over the Earth's surface, meaning that at any given location eclipses can't last longer than a few minutes. At locations outside of this shadow-disc, in a region over a few thousand kilometers, the eclipse is partial.

In the title text Randall reveals that he had traveled to a location in Missouri (possibly the Shaw Nature Reserve) because at his home in Massachusetts the eclipse was only partial. And, without a doubt, the total solar eclipse was the coolest thing he ever has seen in his life.

#1881: Drone Training

August 25, 2017



The joke will be on him in a few weeks when animal control shows up and takes custody of his Roomba.

Explanation

In this comic, Black Hat enters a pet store run by White Hat. He wants to buy something to help him train his drone, which keeps flying into the wrong rooms. This is absurd as drones are semi-autonomous flying machines, not living creatures like dogs or cats, which can be trained to do tricks, or stay in the correct areas (inside his property). Alternatively, Black Hat could be developing a way to make drones sentient/autonomous in order to annoy other drone-owners when their drones don't obey them or to allow Black Hat's drones to annoy other people without Black Hat having to control them. He also wants a shock collar for his Roomba, which would train it to stay inside or at least on his lawn.

Cat repellents are devices or substances for training cats or repelling them from furniture or other areas. An example of a cat repellent spray which can be created at home as shown here: Friendly (but Effective) Cat Repellent.

Roomba is an autonomous robotic vacuum cleaner and controlling it by electric shocks from a shock collar, normally used for dogs, is more than questionable. Those collars are legal in the US but banned in nine other countries. A Roomba was previously mistaken for a dog in 1558: Vet.

This might be playing with the concept of machine learning. Knowing Black Hat, he might be poking fun at

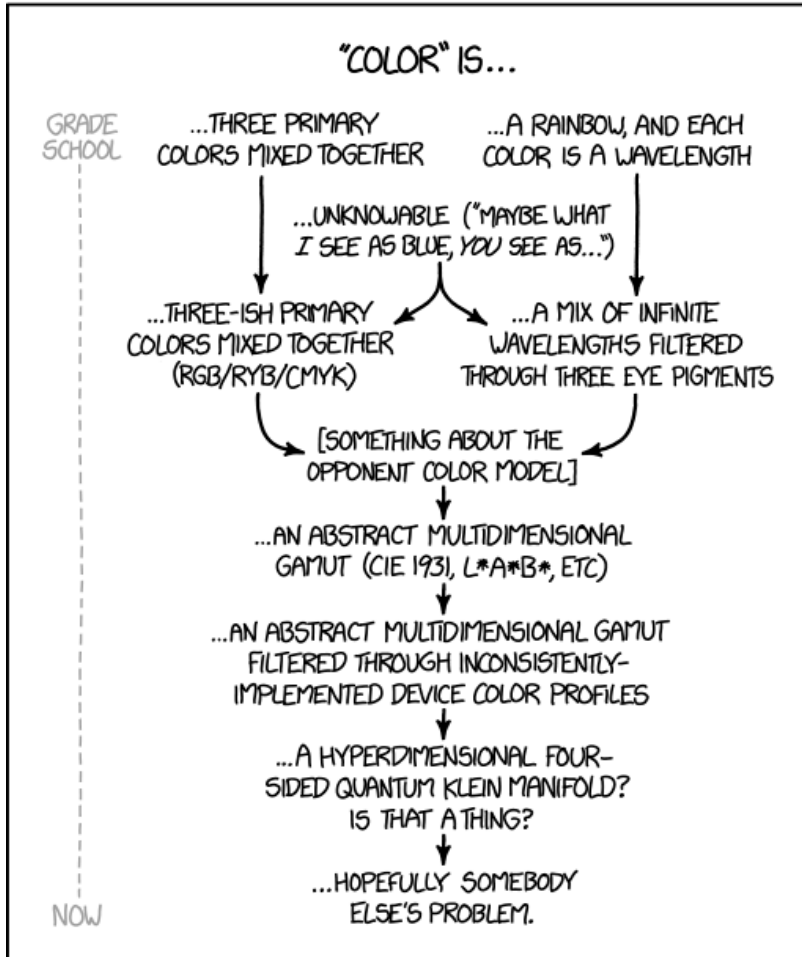
people's assumptions that modern robots are more advanced than they actually are. It is also possible, however, that he just wants to terrify people with the idea of robot abuse/conditioning, and even more likely that he genuinely believes he can force robots to obey him via inflicting suffering.

The title text may mean one of three things: The endeavor will become a total flop when the Roomba gets rid of the collar and terrorizes the neighborhood; as a result dogcatchers from the animal control service will arrest this "wild animal." Or animal control services will confiscate the Roomba to save it from its abusive owner. Or, possibly, the text refers to White Hat, who also owns a Roomba, and it will be taken into custody because it has not been trained with a shock collar.

#1882: Color Models

August 28, 2017

EVOLUTION OF MY UNDERSTANDING OF COLOR OVER TIME:



What if what *I* see as blue, *you* see as a slightly different blue because you're using Chrome instead of Firefox and despite a decade of messing with profiles we STILL can't get this right somehow.

Explanation

Randall is describing how his level of understanding of colors has changed by age. The chart starts with two tracks of understanding color.

In grade school he learned about the primary colors, and the very simple model of colors, as shown in the left track. Mixing of color solids, as in painting (or finger painting being probably the earliest exposure to color mixing), is intuitive for a child. The process is subtractive, and the more colors you mix the darker and closer to black you get. Color is seen by the eyes when light bounces off the solid colors and becomes light of different wavelengths that the eye can then see. However at this level, things just "look" like different colors without understanding light's role. The color models mentioned in the second point of the left track are the additive model RGB (red-green-blue) and the subtractive models RYB (red-yellow-blue) and CMYK (cyan-magenta-yellow-key, used in color printing).

The right track is about mixing of colored light, as in prisms and light waves, where mixing colors is additive and the more you mix the lighter and closer to white you get. But this is without a real understanding of light bouncing off surfaces, and is limited to an understanding of different colors of light and how they mix. The first exposure in grade school is usually by shining white light through a prism to separate it into the different visible colors.

Meanwhile, philosophically, color is unknowable because it's impossible to say if everyone has the same qualia for colors. E.g. "Maybe what I see as blue, you see as my idea of purple, but we both call it blue because we've been brought up to know to call that color blue?."

The opponent color model connects these two models, by considering how the signals from rods and cones are processed, after different wavelengths of light are absorbed by different rods and cones in the eyes.

The "complex multidimensional gamut" mentions two more models: CIE 1931 and $L^*a^*b^*$. These are more detailed models based on the opponent color model, which precisely define how a particular color maps to the different channels that our eyes see.

However, understanding how the eye sees color still isn't enough, because not every device can display all the colors your eye can see. Your laptop might have a different gamut from that of your phone, and when you print the page, you might see yet another color. To handle this issue, web browsers use "color profiles", so that an image can be tagged with the color space it uses and the browser can handle it appropriately. Unfortunately, browsers do this inconsistently and not very well.

Further complicating the matter, ostensibly identical device may show colors differently (depending on how they are adjusted, variations between devices, aging of the device, and the viewing environment). Devices and

software exist to attempt to match systems to reproduce colors consistently, however most systems are not set up this way, color correction can be complicated, and the corrections have to be frequently readjusted.

The "hyperdimensional four-sided quantum Klein manifold" is a joke, and could also be a pun upon the color Klein Blue. A Klein manifold is described by the Klein bottle, where the bottle was originally a surface (a mix-up of the German words Fläche for surface and Flasche for bottle). It is a two-dimensional manifold, or simply just a surface with some special characteristics. Randall is here projecting an "abstract multidimensional gamut" onto an even more complicated surface, presumably in order to eliminate the errors in color rendering caused by previous attempts to eliminate the errors in color rendering. The Klein bottle has to be projected into 4 dimensional (4-D) space for this to work, as it would otherwise intersect with itself.

The "quantum" may be a reference to the "color" charge in Quantum chromodynamics.

Eventually it appears Randall has given up, realizing color is very difficult and hoping somebody else will deal with the difficulty in describing, understanding and using the concept of colors.

The title text expands on this joke, implying that the reason for the "unknowable" answer in the comic is that everyone's browser shows colors slightly differently. Despite the complexity and thoroughness of color

models, this common software can't get it right.

#1883: Supervillain Plan

August 30, 2017



YOU CAN TELL WHEN SOMEONE'S BEEN A PROGRAMMER FOR A WHILE BECAUSE THEY DEVELOP A DEEP-SEATED FEAR OF TIME ZONE PROBLEMS.

Someday, some big historical event will happen during the DST changeover, and all the tick-tock articles chronicling how it unfolded will have to include a really annoying explanation next to their timelines.

Explanation

In this comic Black Hat is a supervillain, befitting his character. He plans to use drones and explosives to move the entire State of California into the Pacific, a la Lex Luthor in the 1978 Superman movie.

His henchmen are Cueball and Megan. The latter appears to be a programmer who is concerned that the mission (and hence the drones' coding) may have to account for time/date adjustments, such as time zones and daylight saving time (DST), which would be a factor if the event took place on the wrong date or the landmasses were pushed too far apart. (Though by coding the drones on UTC, the drones would not need to change time zones, except for displaying the local time for some reason, which would likely be unneeded.)

In computer programming, working with dates and times can be complicated. Think about leap years or leap seconds, the non existing year zero which even worse for scientists does exist in astronomical calendars, or the Y2K and year 2038 problem. Nevertheless in this comic there is only a time zone problem mentioned. To handle this the tz database, also known as tzdata, provides all relevant information for every country back to 1970 and, less accurate, before. But it's still up to the programmer to use this data in useful ways.

Supervillains have reason to fear daylight saving time issues. In 1999, two coordinated car bombings ended up

killing the terrorists transporting the bombs when they exploded one hour early. Details explained e.g. on the Darwin Awards site.

Time zones and DST can give seemingly nonsensical results when used improperly. For example, a flight going west might leave at 02:00pm and reach its destination at 03:00pm while the reverse flight will leave at 02:00pm and arrive at 05:00pm. In both cases, the travel time is two hours, but the one hour difference between the two time zones makes it seem otherwise. You might even find yourself arriving at your destination at an earlier time than your departure! DST can also makes a given time mean two different things, if after 01:59am you go back to 01:00 am, 01:30am can either be one hour after 00:30am, or one hour before 02:30am. Or in the reverse change, some dates don't actually exist, like 02:30 when going straight from 01:59 to 03:00. Humans often avoid this issue by being in only one place at the same time,[citation needed] or by sleeping when the DST changes happen, but computer communications often span over large distances, and drones don't need to sleep at night. Megan wants to make sure she won't have to deal with the difficult problem of communication between drones and other systems with those issues, where a single poorly communicated date can have disastrous effects (although possibly far less disastrous than moving California into the sea).[citation needed]

California is currently located entirely within the UTC-8 time zone (at standard time PST, while in summer PDT is at UTC-7). But after Black Hat's actions California is

at risk of floating West into the next time zone at UTC-9.

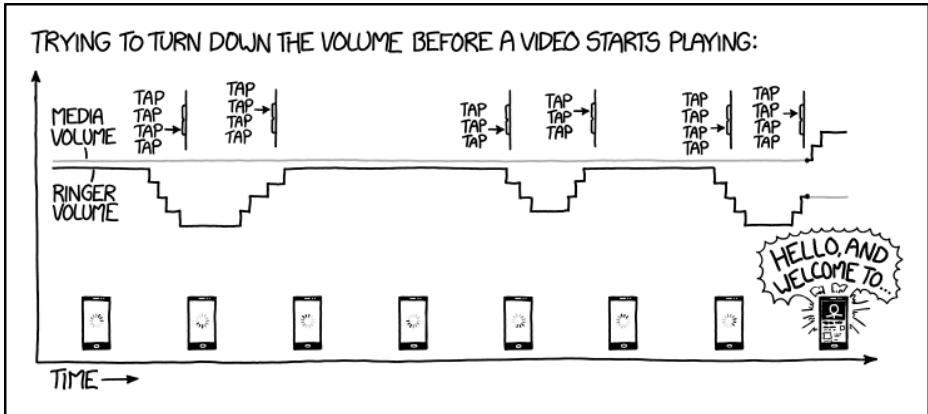
However, in reality, time zones in the United States are determined by Department of Transportation regulations, and California's time zone is not defined based on its longitude. Consequently, even if California were pushed out to sea, its time zone would remain the same unless the Department of Transportation issued a regulation otherwise, so Megan can rest easy. (On the other hand, Black Hat could alter the time zone of any of the East Coast states except Maine if his drones could push the state east of 67°30' W. longitude, since the Eastern Time Zone's eastern boundary is mostly based on longitude, except for Maine.)

Note: Megan should be happy Black Hat hasn't planned to involve Arizona in his scheme, as most of it (sans the Navajo Nation) doesn't observe DST (see 'Time in Arizona'), though she may get a little squeamish at Cueball weaponizing its weirdness in 3014: Arizona Chess.

A "tick tock article" is a term in journalism for a step by step account of an event or timeline, such as this one recounting the end of the 2011 MLB regular season. Such an article published for an event during the change to or from Daylight Saving Time would need to account for the changeover, making the timeline confusing for those unaware of the switch.

#1884: Ringer Volume/Media Volume

September 01, 2017



Our new video ad campaign has our product's name shouted in the first 500 milliseconds, so we can reach the people in adjacent rooms while the viewer is still turning down the volume.

Explanation

Most smartphones, when this comic was published, have multiple system-level sound volume settings, such as, phone call ringer volume, timed alarm volume, phone communication volume, and media volume (which covers video, music, games and such). For comparison, personal computers tend to expose the user to a master sound volume control by default, which affects all the sounds emitted by system. Applications that emit sound (other than basic interface sounds, such as clicking) tend to implement a separate volume control.

Further, smartphones often have a pair of hardware buttons for raising or lowering sound volume. However, they don't differentiate which of the available volume controls the user wants to adjust. Smartphone operating systems tend to adjust the volume level of the currently emitted sound type, with some defaulting to the phone call ringer in the case no sound is playing. Adjusting arbitrary volume control is usually possible using a system settings app controlled by touch screen, which can take more time than pressing dedicated buttons, and/or stopping the program currently being used, depending on the smartphone in question.

The comic demonstrates, using a time axis, a typical annoyance generated by this kind of setup. A implied user wants to play a video clip but expects its sound volume to be too loud, so the user starts to preemptively press the volume down button. However, since the video

clip just started loading while the user preemptively pressed the button, this adjusts the phone ringer volume instead of media volume. The user proceeds to raise the ringer volume and waits until the information box about ringer volume being adjusted disappears from screen, then tries again. Since the video is still loading this still doesn't work. Apparently the application needs to start emitting sound before the possibility of adjusting that sound with volume buttons arises. This is exactly what eventually happens - the video starts uncomfortably loud and the user's delayed reaction while attempting to readjust ringer volume level leads, in fact, to raising the media volume. At this point the graph ends, though the user is implied in the title text to proceed to reduce the video's volume directly afterwards.

Despite most applications implementing separate sound controls, Windows has also offered the option to adjust volume on per-activity basis since at least Windows 95. You can access this feature on Windows 10 by right-clicking the speaker icon on the tray, and selecting the "Open Volume Mixer" option. This setup is roughly equivalent to opening system settings on a smartphone, in that user can see multiple volume controls and select to adjust some. Additionally, some versions of Windows made the system tray volume control only affect the currently focused program, sort of analogously to described smartphone behavior, in that a single interface area can correspond to different volume controls depending on the context. However, this feature has been removed in more recent versions, presumably to

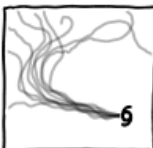
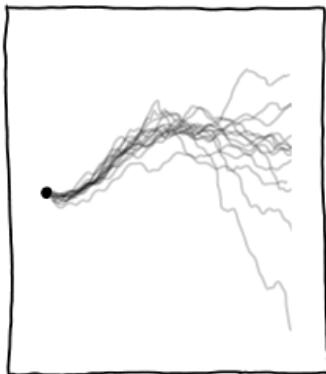
reduce user confusion.

The title text presents a method of exploiting the phenomenon presented in the main comic by putting important parts of an advertisement very early in the video clip in loud audio form. Since user may have problems with adjusting video sound volume before it starts playing, this will result in the important part of ad (here, product name) emitted very loudly, to the levels of narrator of title text expecting it to reach people in other rooms than one the smartphone is in.

#1885: Ensemble Model

September 04, 2017

IN AN *ENSEMBLE MODEL*, FORECASTERS RUN MANY DIFFERENT VERSIONS OF A WEATHER MODEL WITH SLIGHTLY DIFFERENT INITIAL CONDITIONS. THIS HELPS ACCOUNT FOR UNCERTAINTY AND SHOWS FORECASTERS A SPREAD OF POSSIBLE OUTCOMES.



MEMBERS IN A TYPICAL ENSEMBLE:
A UNIVERSE WHERE...

- ...RAIN IS 0.5% MORE LIKELY IN SOME AREAS
- ...WIND SPEEDS ARE SLIGHTLY LOWER
- ...PRESSURE LEVELS ARE RANDOMLY TWEAKED
- ...DOGS RUN SLIGHTLY FASTER
- ...THERE'S ONE EXTRA CLOUD IN THE BAHAMAS
- ...GERMANY WON WWII
- ...SNAKES ARE WIDE INSTEAD OF LONG
- ...WILL SMITH TOOK THE LEAD IN *THE MATRIX* INSTEAD OF *WILD WILD WEST*
- ...SWIMMING POOLS ARE CARBONATED
- ...SLICED BREAD, AFTER BEING BANNED IN JANUARY 1943, WAS NEVER RE-LEGALIZED

I'm in talks with Netflix to produce an alternate-universe crime drama about the world where sliced bread was never re-legalized, but it's going slowly because they keep changing their phone numbers and the door lock codes at their headquarters.

Explanation

An ensemble model is a combination of multiple, similar models to show a wider range of possible outcomes. The graphs on the left are tracks of predictions from multiple models. In this comic, Randall starts out describing actual changes that ensemble models show, but sinks into absurdity, describing strange alternate universes and scenarios that likely would not be necessary in an actual model.

The upper graph shows a typical plot of predicted wind speeds over time from various ensemble members. The graph shows that it is predicted that the storm will strengthen, with varying degrees of weakening depending on the ensemble member. The graph at the left bottom is a typical map of isobars (lines of equal pressure) for various ensemble members with the ensemble members showing slightly different configurations. The bottom right graph is a typical hurricane path-prediction graphic, starting in the Atlantic moving westwards and then turning to north, often with the Caribbean Islands or the US coast in the path. Some hurricanes don't reach mainlands and after turning north they head eastwards and can reach Europe still as strong storm.

The term universe is in mathematics a class that contains all the entities of an ensemble in a given situation. Don't be confused with the more common usage of the words universe, the entire space where we live, and multiverse, a hypothetical set of possible universes.

The first three outcomes are real while the others are less serious. They are explained below:

These realistic outcomes are only possible under calm weather conditions. Predicting these values with an accuracy better than 1% indicates that the model is stable even when the initial conditions are slightly changed. Modern weather forecasts at normal circumstances are often not good as this and for a hurricane or tornado the variances are much higher.

This is where the comic diverges from reality; there is no reason to have the locomotion speed of dogs as a parameter in a usual weather model[citation needed].

The speed of dogs might be a parameter in a wildlife model, where the speed of a predator might affect the predator/prey ratios. In terms of weather models, dogs traditionally chase cats, so running faster might affect the number of cats. Cats prey on birds, which in turn eat insects. So faster dogs might increase the number of birds, reducing the number of butterflies. Butterflies in turn affect the weather through the butterfly effect (that is that the movement of a butterfly's wings may change the development of tornados, or other weather, in difficult to predict ways, as for instance with the quantum weather butterfly).

This situation is most likely too specific and subtle a difference to be useful to the model.

"What if Germany won World War II" is a very popular subject for alternate history stories.

Snakes being wider than they are long (think "eyes and mouth in the middle of their body and a tail on both sides") in present reality would have enormous consequences for zoology and other fields of biology, including evolutionary biology. It would also have an impact on art history, especially where it involves paintings depicting certain scenes from the book of Genesis. Compared to these effects, the expected upshot for meteorology seems to be limited.

Actor Will Smith famously[citation needed] turned down the lead role of Neo in *The Matrix*, instead taking the role of Captain James T. West in the widely-panned action-comedy *Wild Wild West*. The role of Neo ultimately went to Keanu Reeves.

Besides the significance of the role and what many surmise might have happened if Smith had pulled off the role in the iconic and groundbreaking film trilogy, another possible reason behind calling out Will Smith in particular is that he has turned down other offered roles that would place him in an ensemble cast, rather than the lead.

A simple calculation reveals this as a serious greenhouse problem. In the United States alone there are no less than 5,000,000 private owned pools. Conservatively assumed, a volume of 25,000 liters per pool gives 125 billion liters of carbonated soda. According to Wikipedia the U.S. sales reached around 30 billion bottles of water in 2008 (including non-carbonated water) which is much less than all of the pool water. While all those bottles are not

considered to have an impact on the greenhouse effect, this scenario gets even worse. Open a bottle of carbonated water and pour the content into a glass. Sooner or later the bubbles fade, meaning you have to open the next bottle and pour it in and so on. In a pool at the bottom the pressure is high enough to hold the carbon dioxide, but on the surface it behaves like the glass. So, while a glass needs new carbonated water every two hours, or ten times per day, it would be about three times per day for the pool, which leads to 1095 times per year. The total number in this scenario would be 125 trillion liters of carbonated soda, ejecting carbon dioxide, per year. Even taking into account the pressure at the bottom of the pool: Randall has shown in Soda Sequestration this effect would be minimal.

Sliced bread was in fact banned in the US for about two months in early 1943, as a supposed wartime conservation measure. The issue was not the bread itself, but that the pre-sliced loaves required a heavier wax paper wrapping to prevent them from drying out too quickly.

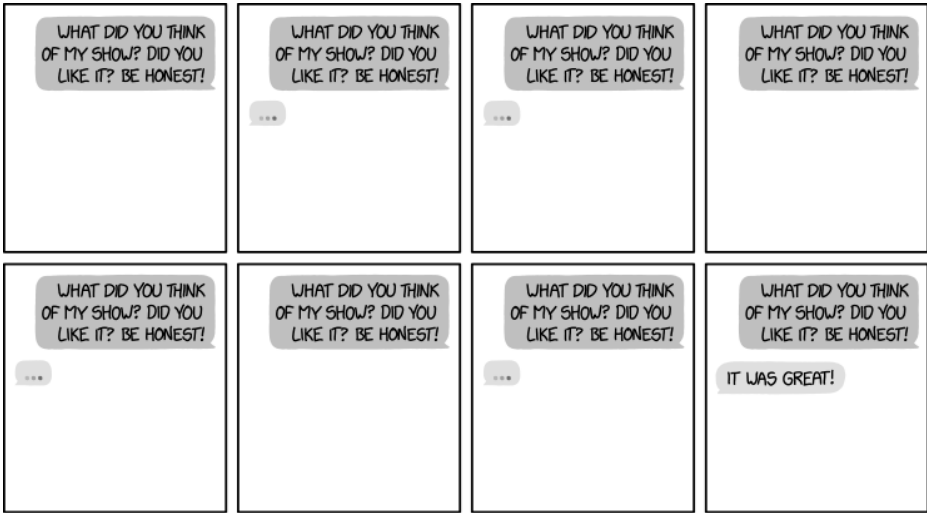
The title text suggests that Randall has been pitching an absurd "alternate-universe crime drama" to Netflix, apparently based on the premise that a permanent sliced-bread ban would spawn a criminal underground (similar to those created by alcohol and drug prohibitions in actual history). The first half of the sentence is set up to imply that production had started on the series but a breakdown in communication has occurred between them, playing on the reader's

expectations. The conclusion of the sentence nonetheless makes it clear that Netflix has zero interest in the pitch, and so Randall has become overzealous in pushing his idea, to the point that Netflix employees are changing their numbers (presumably they can't block his number because he has resorted to calling from many different phones). He has even taken to infiltrating Netflix's corporate headquarters using ill-gotten security codes, which is definitely illegal[citation needed], much like [Elaine Roberts]]'s "meetings" with Steve Jobs in 1337: Part 3.

However, it is clear that Netflix is uninterested and is attempting to prevent Randall from contacting them (or trespassing into the building).

#1886: Typing Notifications

September 06, 2017



MY LEAST FAVORITE ASPECT OF TYPING NOTIFICATIONS

Over the years I've decided I'd rather have them on than not, but I'm glad there aren't "has opened a blank note to compose a reply to you" notifications.

Explanation

Randall has sent an instant message to someone and is now watching the screen expecting a reply. The message contains simple questions about a show Randall had undertaken and he insists on an honest answer, which would indicate that this is an emotionally fraught question for Randall and he has anxiety about the answer. His anxiety is compounded when the phone indicates that the respondent is typing a response, but then pauses, resumes typing, and pauses a second time, before sending a simple "It was great!"

Typing notifications, often called "typing awareness indicator," is a feature of some instant messaging systems. It lets you know when the other person in a conversation is typing and preparing a reply. It may appear in different forms, like the literal text "[Contact] is typing." or often has a empty answer (possibly a different color) containing three animated dots. It gives the sender confidence that their message has been received and the other one is working on a reply.

However, in this case, when the final response is received it is the anodyne "It was great," suggesting that the first two deleted drafts could be far more critical. The fact that you know that a message has been deleted or edited twice provokes you to imagine what the deleted drafts may have contained. Additionally, the notifications could be misleading; the distant contact might just have been doing something else at the same time, had an

unsteady internet connection, started typing in the wrong conversation, or corrected a typo. However, because Randall has interpreted the long pauses the same way one would read face-to-face interactions, the typing notifications make it seem like they weren't honest.

If one partner of a conversation takes their sweet time to reply, possibly deleting their text and starting from scratch as shown in this comic, the typing notification feature can lead to anxiety, as the person waiting for a response starts to overthink the issue. Thoughts come to mind like the other person might not be honest, try to carefully word a sensitive subject or not care enough about you to quickly reply. If finally the answer arrives and consists of just a laconic "ok" or similar, these feelings become even stronger, leading to thoughts like the other person is trying to hide something. This phenomenon has become so widespread that many people have written about it in newspapers and blogs, calling it texting anxiety.

The caption below the screens summarizes that what Randall dislikes the most about these systems of notification that the other party on the conversation is actively working on a reply is the lengthy alternation between indications that the other party is composing a reply, amidst pauses wherein one presumes the other party is thinking carefully about what they are wanting to say, then more typing as in response to their deep thinking, etc. until at the end of this extended period when one expects the other side to have written a book's worth of notes given the time and work they appear to

have dedicated to the reply -- and all they get is a simple 3-word reply. It leaves him wondering what all the other party really typed, and really thought, that they ended up not sending. This type of notification was mentioned as rule no. 1 in the much later 2235: Group Chat Rules.

One way around giving your text receiver texting anxiety would be to open a blank note and work out what you want to say there. Since you're not typing in the messaging app, there's no typing notification.

In the title text, Randall expresses that he likes to watch when the recipient reacts and is trying to write an answer but he's also happy to not receive notifications that the texter is composing a response in a blank note file. Typically, one composes responses in blank notes when they need to be careful or thoughtful about how they respond (as well as avoid alerting the recipient, via the notifications, that they've received their text and are preparing a response). If Randall were to be notified about such actions, it would confirm his above fears that the writer was being tactful and guarded in their response, which would just lead to more anxiety about what they were trying to hide. Also, it would expose him if he wanted to compose his own message privately.

#1887: Two Down, One to Go

September 08, 2017

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
TOTAL ECLIPSE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
AURORA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
METEOR STORM	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The third row will probably have to wait until **2034**, and maybe longer. If I see a daytime supernova, I'll replace the meteor storm with that and consider it **3/3**.

Explanation

In this comic, Randall lists three of the most spectacular astronomical sights: a total solar eclipse, an aurora (Aurora Borealis in the northern hemisphere and Aurora Australis in the south), and a meteor storm. In 2017, the first two of these phenomena happened within weeks of each other for observers in much of the US - a coincidence that Randall celebrates.

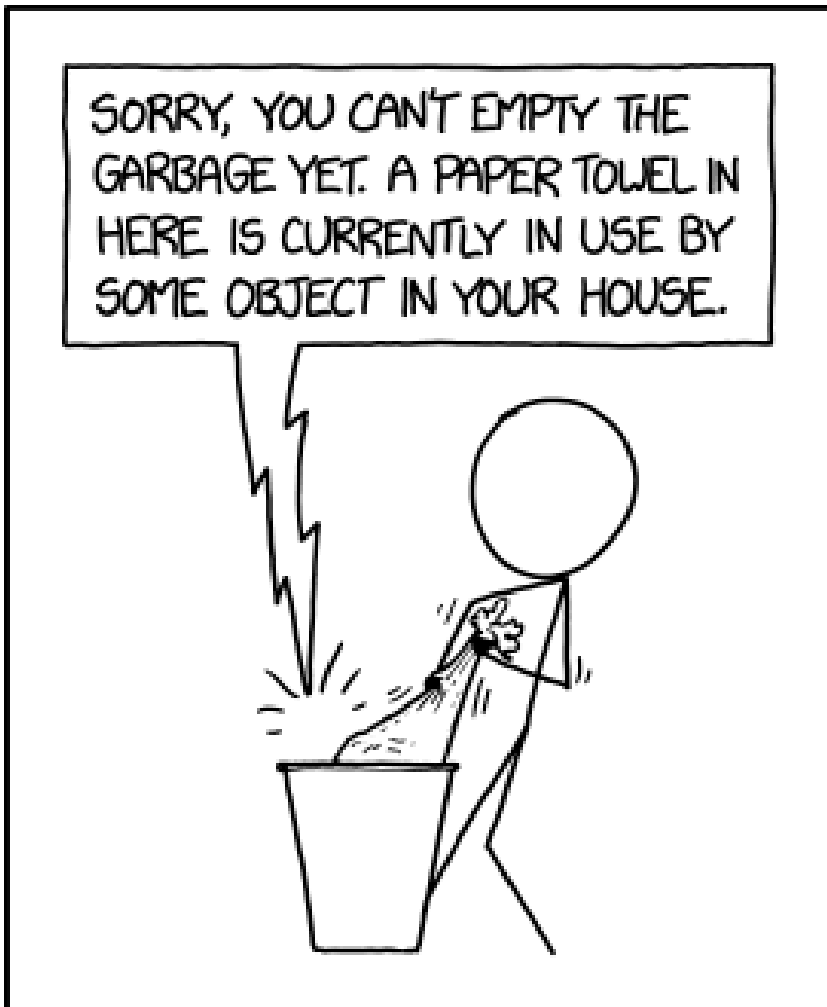
- Total solar eclipse: The total solar eclipse of August 21, 2017 was the first seen for decades in the contiguous United States. Randall already made several comics about this eclipse and had traveled to Missouri to witness this for himself as shown in this comic: 1880: Eclipse Review.
- Aurora: The aurora borealis is rarely visible from the continental USA. Randall bemoaned the fact he'd never seen one back in 1302: Year in Review in 2013 - which also mentioned the 2017 eclipse. Randall likely finally saw it due to the giant solar flares in the week leading up to this comic probably without any need of traveling.
- Meteor storm: A meteor storm is more than just a shower - while the best (or worst, depending on how you look at it) typical shower gives you a meteor or two per every minute, a storm gives you meteors every few seconds or better (or worse). The Great Meteor Storm of 1833 produced hundreds of thousands of meteors per hour.

In the title text, Randall suggests the next meteor storm could be 2034, probably because this is predicted to be a good year for Leonids.

Randall then continues by saying that if he manages to see a supernova during the daytime, he will drop the goal for the meteor storm and call it 3 of 3. This is because such an event is so unlikely that he hasn't even included it in his bucket list, and he would be happy to switch between the two types of events if he had the chance. A few stars, when they turn supernova, could be so bright that they can be seen during the day time here on Earth. The brightest supernova recorded in human history was SN 1006 which was sixteen times brighter than Venus but still not bright as the full moon. SN 1054 is an other example. When such an extremely rare event might happen is impossible to predict. There is a (very small) chance that the giant star Betelgeuse will go supernova within Randall's lifetime, allowing him to tick this off the list too. Randall even mentioned that this could not happen soon enough in 1644: Stargazing. Note that if you could see it during the day time, it would be one of the brightest objects in the night sky after the Moon. Also keep in mind that if Betelgeuse were to go supernova in Randall's lifetime, he wouldn't see it since it's over 600 light years away. For Randall to see it during his lifetime, it must have already gone supernova some 600 odd years ago, and we won't know that until we actually see it 613-881 years after it happened.

#1888: Still in Use

September 11, 2017



'Which one?' 'I dunno, it's your house. Just check each object.' 'Check it for *what*?' 'Whether it looks like it might have touched a paper towel at some point and then forgotten to let go.' '...' 'You can also Google to learn how

to check which things are using which resources.' 'You know, I'll just leave the towel there and try again tomorrow.'

Explanation

Cueball is trying to remove the trash bag from his garbage can. However, the can refuses to let him do so, citing that a paper towel in the trash is being used by some object in his home.

This comic draws parallels between the act of emptying a physical rubbish bin and emptying the recycle bin integrated into a desktop computing environment like Windows, macOS, most Linux derivatives, and others. It originated with the Xerox Alto, but was first commercially introduced on Apple Lisa in 1982 called Wastebasket and, while it was adopted by most other desktop environment operating system, using slightly different names, the main purpose still remains: A user can restore a file after they have deleted it -- hence the most common name recycle bin, you still can get your paper towel and use it again. In many (earlier) command line based systems like DOS or UNIX/Linux (besides the desktop interfaces) a removed file was gone. Some undelete commands exist, but there are hard restrictions because the then free space on the hard drive must not have been used again and often file names aren't fully recoverable.

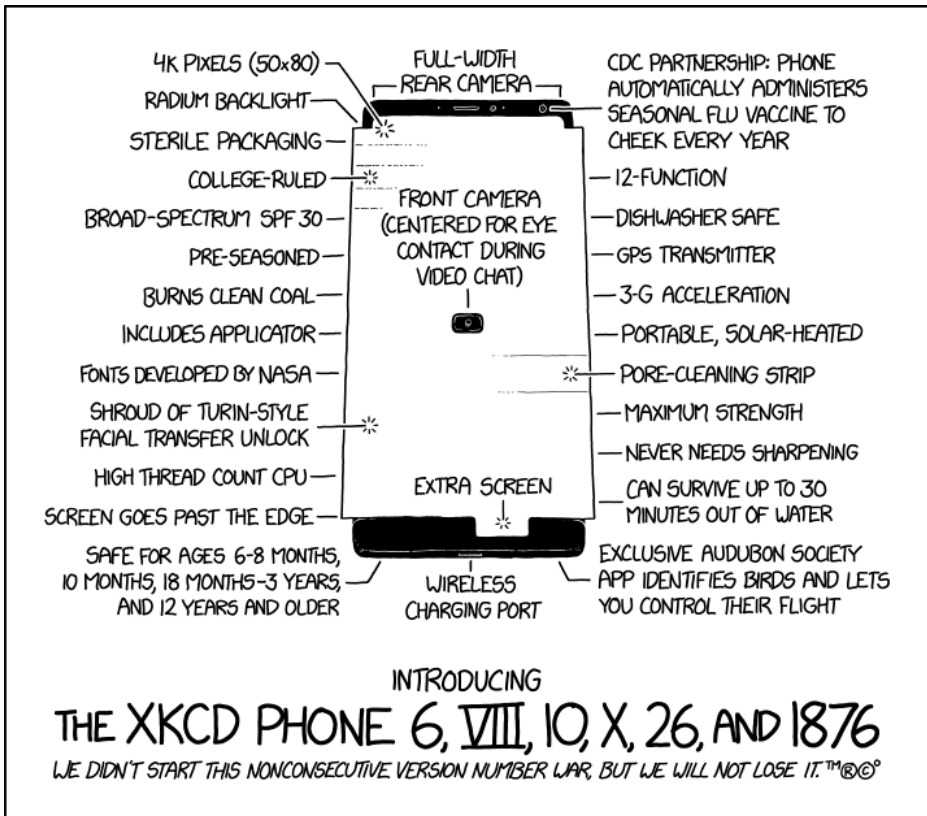
But sometimes when attempting to delete files, a running program may still have the file marked as in use. The operating system will therefore prevent the file's deletion, but some do not tell the user which program is using the file.

Preventing the file from being deleted from the file system in this case may be a correct behavior, because the document is still being worked on. But sometimes it may happen erroneously, perhaps because of a program not closing the file properly, a glitch in the operating system, or user error. The user then is required to find the cause of the problem and rectify it before the file can be deleted. This may be difficult because error messages may not reveal the affected file or the program blocking its removal. Similar problems may occur when unmounting (or "safely removing") a removable storage device.

The title text may refer to a simple solution to these sorts of problems: Wait a while, perhaps overnight, and see if the (unknown) application(s) have closed the open file(s). Alternatively, the user can shut down the system to make absolutely sure that nothing is using anything. This is usually effective and harmless -- programs that falsely flagged something in the recycle bin as "in use" usually won't recreate the problem when the computer finishes booting up -- but this is really not a convenient solution for the user because all applications are closed.

#1889: xkcd Phone 6

September 13, 2017



We understand your privacy concerns; be assured that our phones will never store or transmit images of your face.

Explanation

This is the sixth entry in the ongoing xkcd Phone series, and once again, the comic plays with many standard tech buzzwords, and horribly misuses all of them, to create a phone that sounds impressive but self-evidently isn't to even the most ignorant customer. Its number appears to be 6, VIII, 10, X, 26, and 1876. The same phone having six different version numbers at once is clearly ridiculous. The previous comic in the series 1809: xkcd Phone 5 was released 7 months before this one and the next 2000: xkcd Phone 2000 was released 8 and a half months later. This comic was released the day after Apple announced their new iPhone 8 and the higher end iPhone X (pronounced iPhone 10) with facial recognition features.

The title text recognises privacy concerns about the facial recognition feature. A picture of a face will only be used for facial recognition, but never stored on the device nor transmitted to the internet. A side effect may be that selfie pictures aren't possible to capture anymore, as well as video calls, which is ironic, since the reason the camera is in the middle is to allow easier video calls.

Phone features[edit]

From the top, going clockwise:

Version[edit]

In the tagline below the phone, Randall presents many different version numbers:

- The number 6 is in correct order of all the xkcd phones
- The Roman numeral VIII refers to the newly announced iPhone 8 and jokes about the Roman numeral X below
- Version number 10 is the current version of Microsoft Windows
- The iPhone X was announced together with the iPhone 8 by Apple on September 12, 2017, a day before this comic was released. Apple clarified that X is meant to be read as the Roman numeral for 10, so for additional absurdity two xkcd phones share the same number, using different numerals
- The number 26 refers to the number of letters in the English alphabet
- In the year 1876 Alexander Graham Bell received the U.S. Patent No. 174465 for the invention of the telephone, but there is still a controversy whether Elisha Gray was the first to present a working telephone.

The "nonconsecutive version number war" referenced below the version names refers to several recent phones, and possibly operating systems, released consecutively with nonconsecutive version numbers, including:

- The iPhone X (or 10) was released after the iPhone 8
- The Samsung Galaxy Note 7 was released after the Note 5
- The OnePlus 5 was released after the OnePlus 3T
- The ZTE Axon 7 was released after the original Axon, skipping numbers 2-6.
- Microsoft Windows has a long history of non-consecutive version numbers/names, with the most well-known releases

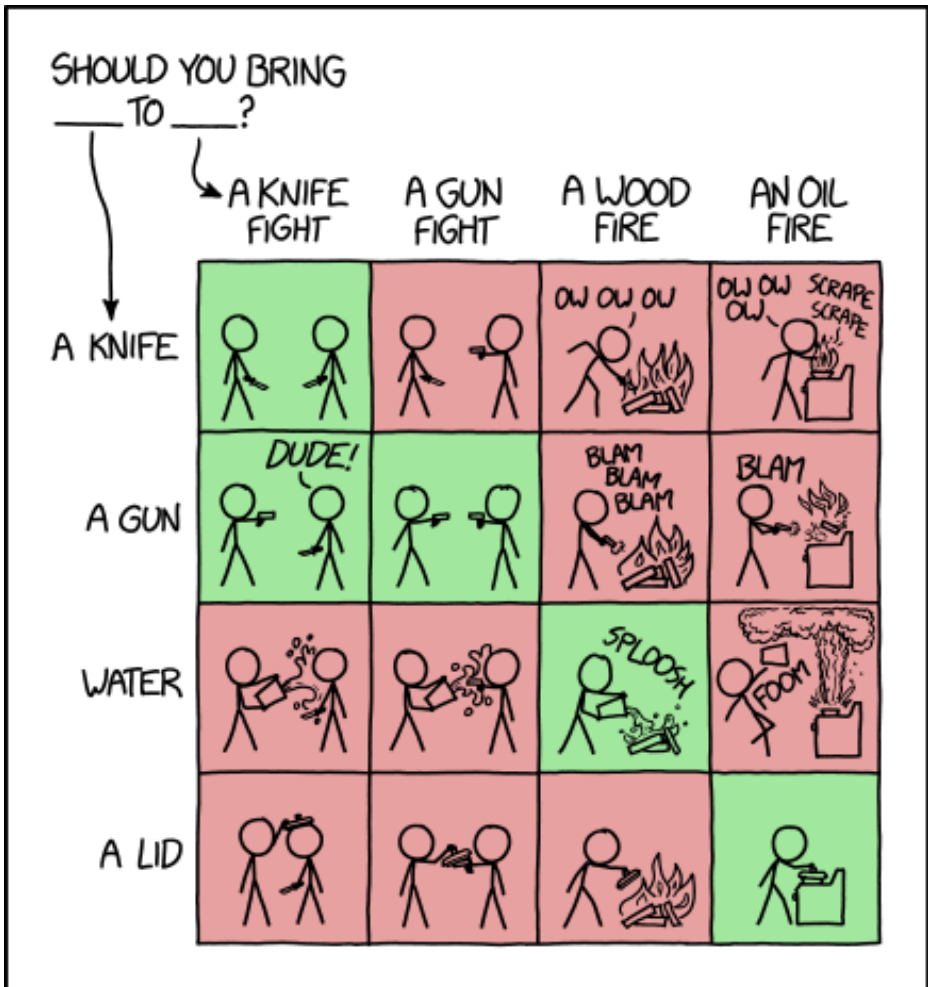
being (in order) 3.1, NT, 95, 98, 2000, Me, XP, Vista, 7, 8, 10, and 11.

Randall's ludicrous naming scheme aims to "defeat" all of these by eclipsing them. By counting parallel version numbers xkcd defeated Apple 6:2.

The symbols at the end are TM for trademark, ® for registered trademark, and © for copyright. The degree symbol ° after the letter C could be a play with degree Celsius. The use of all four symbols after the phrase is ridiculous, as TM and ® indicate trademarks with opposite registration statuses, slogans can't be copyrighted, and the degree symbol usually has no meaning when applied to text.

#1890: What to Bring

September 15, 2017



I always figured you should never bring a gun to a gun fight because then you'll be part of a gun fight.

Explanation

This comic derives its humor from combining two common but unrelated phrases: the proverb "never bring a knife to a gun fight", and the common advice "never put water on an oil fire". The corollary to these phrases is that a knife is only useful for a knife fight, and water is only useful for a wood fire (or similar solid and porous fuel). Randall creates a confusion matrix applying each of the solutions (knives, guns, lids, and water) to each of the situations (knife fight, gun fight, wood fire, oil fire) to predict the likely outcomes.

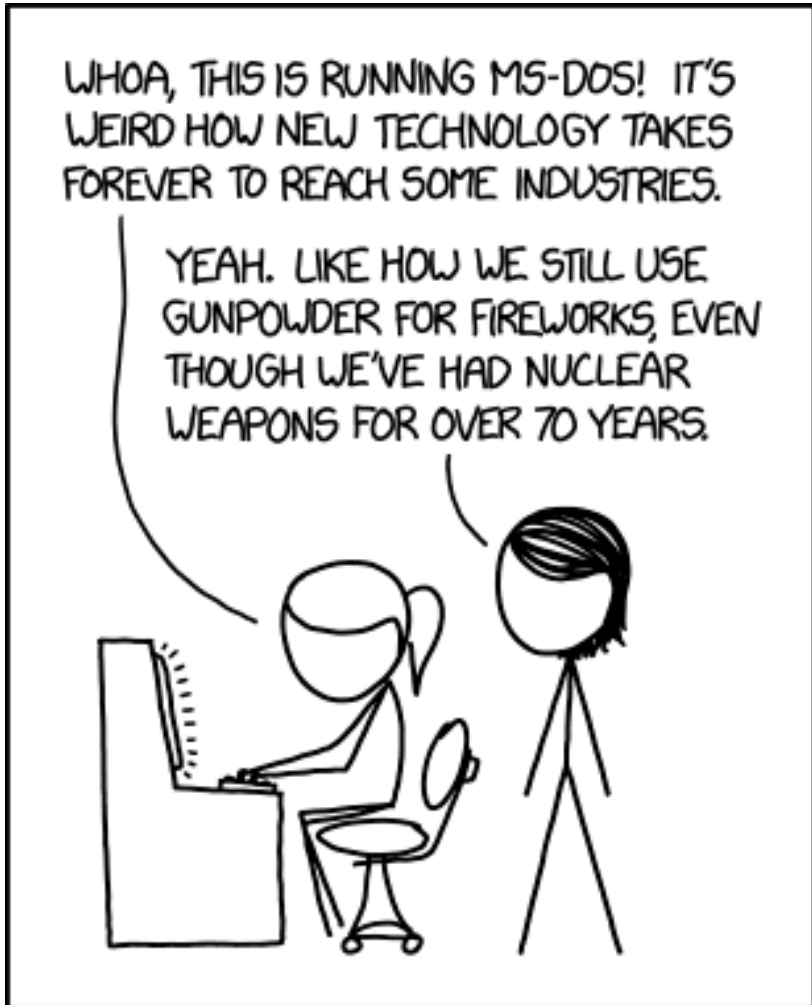
The squares in the table are highlighted in green to answer "Yes" to the question, where the specified object is appropriate or advantageous for the situation, or red to answer "No", usually because the object would not be helpful in resolving the situation. The grid concludes that, not only are both pieces of advice correct (bringing knives to gun fights, and using water on oil fires would both end in likely disaster), but only the prescribed solutions are appropriate for each situation (e.g. any solution other than a lid would be ineffective for an oil fire, and potentially very dangerous). The sole exception to this trend is bringing a gun to a knife fight, which would give you a major tactical advantage over your opponent.

The ultimate point of this comic may be in the title text. There is a phrase in American English, "to bring a knife to a gun fight," which means "to be so naive as to be

unprepared." While Randall may be commenting specifically on managing conflict escalation by being adequately prepared for the situation, it is also possible that he is subtly expressing his opinion about the virtues of restraint.

#1891: Obsolete Technology

September 18, 2017



And I can't believe some places still use fax machines. The electrical signals waste so much time going **AROUND** the Earth when neutrino beams can go straight through!

Explanation

This comic mocks people who criticize an industry for using obsolete technology, even when said technology is sufficient for the task at hand. The claim often comes with the implication that those in charge of the industry are behind the times and cannot adapt to the cutting edge. What these critics often fail to realize is that there are cost benefits to sticking with "obsolete" infrastructure, and that upgrading to the newest tech can introduce unwanted side effects and other risks.

Here, Ponytail acts as one such critic, complaining that the business is taking "forever" to get with the times. Megan uses sarcasm to deliver her counterargument: despite the advent of nuclear weapons, fireworks use the ancient technology of gunpowder (invented in the 9th century), because fireworks are used by civilians for celebratory purposes and should have as few lethal side effects as possible.[citation needed]

As they use gunpowder, fireworks do claim a handful of lives and cause thousands of injuries each year due to improper handling procedures; between June 18th and July 18th of 2016 (thus including the Independence Day celebrations on July 4th), fireworks caused an estimated 11,000 injuries, of which 7,000 had to be treated in hospitals. In the whole year of 2016, four people died (U.S. stats). Nuclear explosions, meanwhile, have "detrimental effects" on human health in the same way sledgehammers have "detrimental effects" to chicken

eggs. For example, should a nuclear explosion at a firework display be too powerful, the spectators, and possibly the neighborhood around the display, would be vaporized instantly. Fallout from a nuclear reaction could spread radiation across a wide area, leading to increased risks of cancers and other detrimental genetic mutations.

In other words, sometimes using newer technology is "overkill" for the purpose, and it might be costlier to switch to a newer technology. For example, many industrial machines were designed and sold in the 1990s when floppy disks were the prevalent means of storing the instructions, but those machines still have one or two or even more decades of usable lifetime left, and the instruction files still fit on those floppy disks. So, in 2017, there are several companies that thrive on buying, refurbishing and selling floppy disks. This report portrays one of these companies.

MS-DOS is a computer operating system made by Microsoft that was dominant during much of the 1980s. When Microsoft released the Windows line of operating systems, they encouraged people to switch to the new platform, which many did. MS-DOS became essentially obsolete when Microsoft released Windows 95 in 1995. However, there remain rare circumstances in which MS-DOS (or another command-line operating system) is still preferred, such as when no mouse, touchscreen, or other pointing hardware is available, or when the hardware does not support a newer operating system. To make matters simpler, there is DOSBox, a free and

open-source MS-DOS emulator which is actively maintained and extended. Likewise, FreeDOS is a free and open-source operating system designed to run on both older and newer computers which is compatible with programs written for MS-DOS.

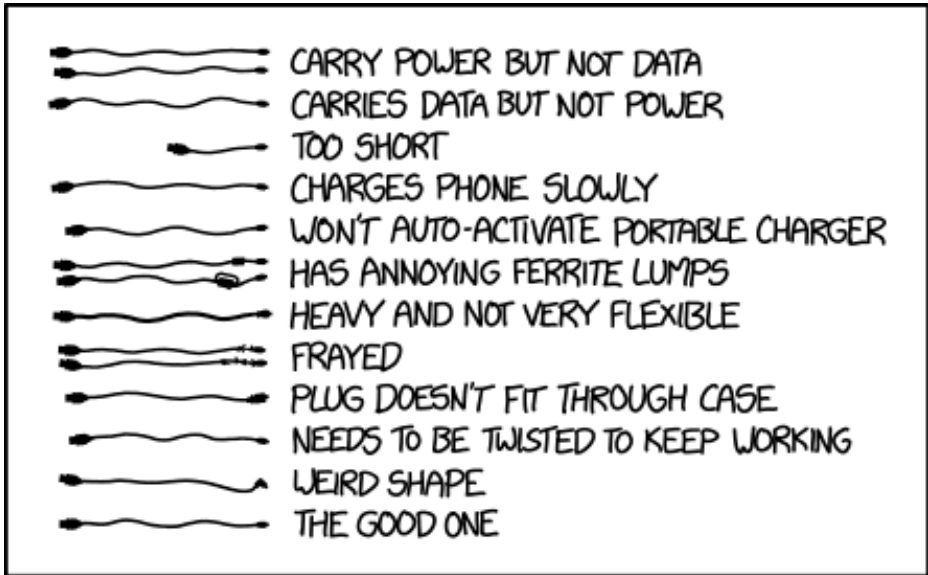
The title text uses a different twist, criticizing the current use of fax machines. In many respects, faxing is obsolete compared to e-mail; it supports only black-and-white images, it complicates the process of modifying sent text by rendering it as images, it consumes the recipient's paper and toner and, in some countries, requires the recipient to pay a fee. Fax machines are a peculiar topic among "obsolete" technology; in some fields, like lawyer offices, pharmacies and medical practices, they staunchly hold their ground, as they offer a way to quickly transfer handwritten and hand-signed documents. Confidentiality is also an issue; fax, which uses a landline, is more difficult to intercept than internet-based traffic. In some countries, a telecopy is a valid document, having the same legal value as the original. A patient can thus call their doctor to fill a prescription, which is faxed to the pharmacy where the patient can fetch their drugs, saving precious time. In the same manner, a legal request can be sent to the receiver, without having to use a courier or express mail.

But rather than argue on any of the above points, the title text instead claims that faxing is obsolete due to being electron-based, while neutrino-based communication would be faster. In 2017, neutrino detectors are heavy and expensive, used for nuclear research only. Electronic

communications travel at a fair share of the speed of light and the advantage of path would be at most a factor of $\pi/2$, so neutrino-based communication would normally be far too expensive compared to the speed gain. Even in the most extreme case (communicating between antipodes), the time saved would be a few hundredths of a second – insignificant for almost all purposes, but potentially enough to gain an edge in high-frequency trading, as suggested in a 2012 Forbes article. Real-world fax detractors would rather replace it with other electronic communication systems, not neutrinic ones.[citation needed]

#1892: USB Cables

September 20, 2017



THE LAW OF USB CABLES:
NO MATTER HOW MANY YOU GET,
YOU ONLY EVER HAVE ONE GOOD ONE.

Tag yourself, I'm "frayed."

Explanation

In this comic, Randall states the 'Law of USB cables': You will never have more than one which has no problems, no matter how many you get. Now that most devices charge off USB, having a cable (specifically, USB-A (the big end) to Micro-B or USB-C (the small end)) is essential. However, most USB cables are cheaply made, and carrying them around quickly damages them. This comic lists some common (and not so common) problems with USB cables.

- Carry power but not data - USB cables have separate data and power lines. To save money (and sometimes for security reasons), the data lines can be omitted. This means it can be used for charging, but not data transfer. Two cables are shown with this problem.
- Carries data but not power - Not typically done, but it could happen if the wires or pins get damaged. While such a cable is theoretically possible, if used with standards-compliant devices, it would appear completely broken.
- Too short - Another money saving wheeze, some devices ship with pathetically short cables.
- Charges phone slowly - More likely a problem with the charger than the cable, but may happen if the wires are damaged. Refers to some chargers not delivering more than half an ampere. Could also be caused by thin or very long wires which lead to a significant voltage drop, thereby reducing charging speed. This is also a typical

user experience for cables that carry power but not data, as charging current/voltage negotiation typically happens over the data lines.

- Won't auto-activate portable charger - Most portable chargers (basically big batteries) should activate when the device is plugged in. Something about the cable (possibly the way the data lines are shorted) is interfering with this mechanism.
- Has annoying ferrite lumps - Ferrite beads are used to filter out interference from the cable. High-performance applications need these, but on a phone charger you're just adding unnecessary weight and bulk. Two cables are shown with this problem.
- Heavy and not very flexible - Either a heavy-duty USB cable, with thicker insulation, or a shielded one with a metal sheath inside to keep out interference.
- Frayed - Cables with improper strain relief experience a lot of bending force at the ends, near the connectors, and these can easily burst the insulation as shown here. Two cables are shown with this problem.
- Plug doesn't fit through case - Manufacturers don't always follow the standard for what the plastic housing around the USB connector should look like, and sometimes these are molded so they don't quite fit in the phone socket or through the charging port of an external case.
- Needs to be twisted to keep working - The wires inside are damaged, and only connect when held in just the right way. One step away from total breakage.

- Weird shape - A normal USB cable but the connector is molded with a 90 degree turn (which is actually specified in the MicroUSB Specification, see pages 28-31) for no apparent reason and might be not convenient in some situations.
- The good one - This is the one that really works out of the 15 shown, with 11 different problems. The funny thing is that it looks more or less exactly like at least 6 of the other 14. So it will take some time to find this cable.

The title text refers to the popular meme "Tag yourself, I'm..." which is used with pictures containing lots of strange objects, phrases or other elements. The phrase prompts people to identify individual elements from the image that they personally feels matches their own identity, usually self-deprecatingly. (The meme stems from Facebook, where people can place tags identifying themselves in photos, but has spread to other websites without an actual tagging system.) Here, Randall suggests that, like a USB cable, he's frayed. "I'm frayed" is also a pun on the sentence "I'm afraid" that is commonly added to the end of a comment which the speaker believes may leave a negative impression on the listener.

#1893: Thread

September 22, 2017



THREAD: THE GREATEST THREAT
TO OUR LIFE ON PERN 1/1

PERN IN THE FUTURE



Since the current Twitter threadfall kicked off in early 2016, we can expect it to continue until the mid 2060s when the next Interval begins.

Explanation

F'nor is a character from the popular sci-fi/fantasy series *Dragonriders of Pern* by Anne McCaffrey. He is posting a Twitter comment (a "thread" that's only one comment long, hence "1/1") about "Thread", a massively destructive alien organism from the same series. Pern is a fictional human-colonized planet and the main setting of the series.

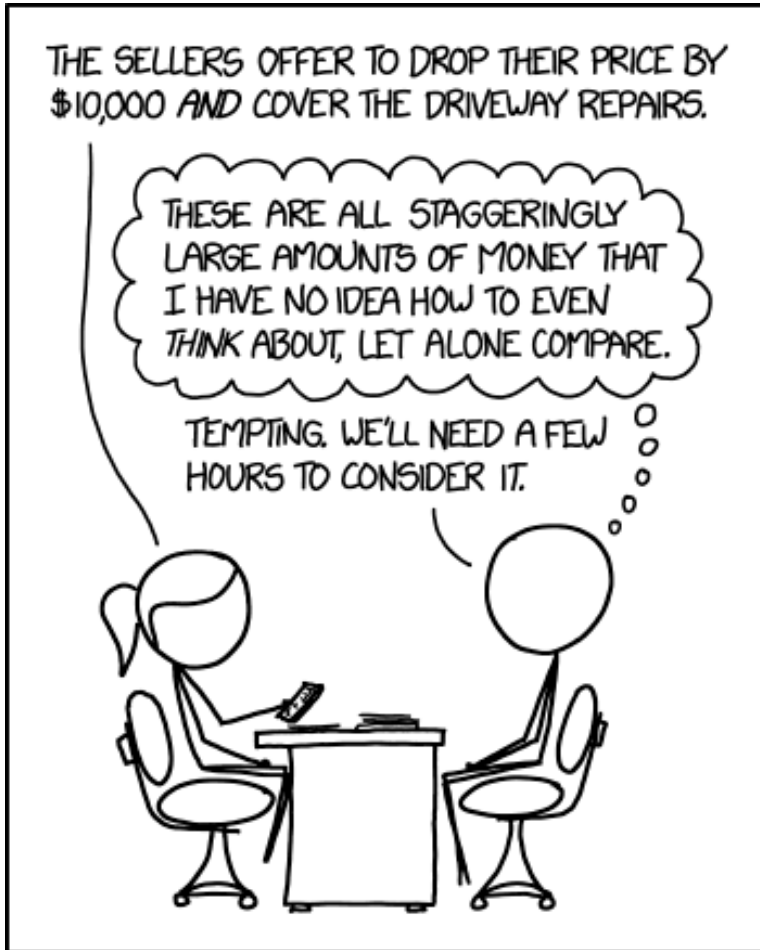
Typically, when starting a series of tweets (used to post content longer than 140 characters), one will start the first tweet with "Thread: " and end it with 1/X. The second tweet will read 2/X, and so on. If X, the total number of tweets, is unknown at the start, it will be listed or 1/many or omitted: 1/

Here, there is a play on the Twitter thread and the actual threat to Pern.

The use of threads on Twitter became significantly more common in 2016 and through 2017. The title text dubs this "Threadfall." In the Pern novels, Threadfall is also the name for the beginning of 50-year cyclic periods when Thread attacks the world of Pern and its inhabitants, which occur between relatively safe "Intervals" of around 200 years. Since according to the title text Threadfall occurred in 2016, it should be expected to continue for ~50 more years until the mid-2060s, when the next Interval will begin.

#1894: Real Estate

September 25, 2017



ME IN ANY FINANCIAL NEGOTIATION

I tried converting the prices into pizzas, to put it in more familiar terms, and it just became a hard-to-think-about number of pizzas.

Explanation

In this comic, Cueball is speaking with Ponytail, his real estate agent, about an ongoing negotiation over the price of a house he is looking to buy. This is probably his first time buying a house and he is very overwhelmed by the process, a very common feeling among first-time home buyers. Houses are the largest single purchase most people will ever make, involves sums far greater than most people typically deal with. The housing market is so complicated and ever-changing that it is almost impossible for the layman to have a clear understanding of what a piece of property is worth. One must rely on the opinions of their real estate agent, building inspector, friends and family, along with research regarding the housing market in the area (average property values, what houses recently sold for, etc). Despite the comic mocking it as an obvious stalling tactic, telling the agent that you need time to think about it is a good strategy to research further while seeming to know what you're doing.

In the caption Randall makes it seem that he is in Cueball's situation in any financial negotiation, not only for such large ones as when buying real estate.

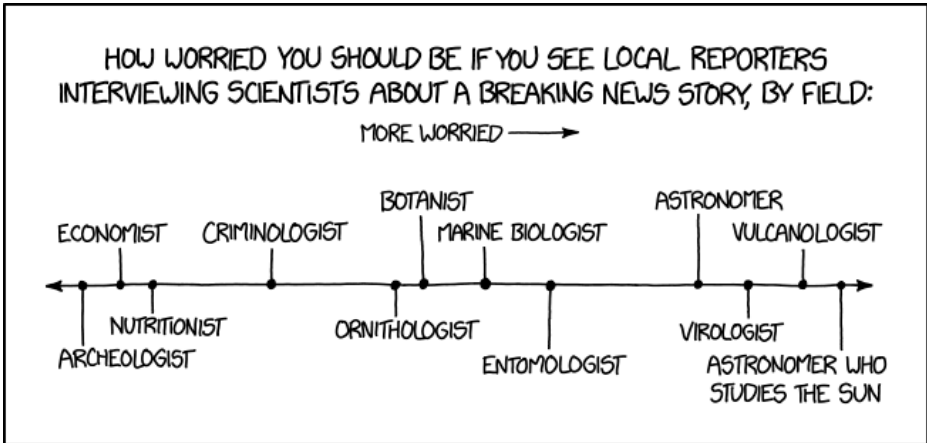
In the title text Randall mentions that he tried to convert the prices into the equivalent numbers of pizzas that amount could buy. Humans can't directly comprehend large numbers, and the value of money is what it can buy, so thinking of a sum of money in terms of a commodity you regularly buy is a pretty good tactic. However, when

dealing with the sums of money involved in real estate purchases, that once again becomes meaningless: the \$10,000 price reduction translates to hundreds of pizzas and the typical price of a house translates to thousands of them. At this point, the volume of pizza becomes as incomprehensible as the amount of money itself. A better tactic might be to think in terms of the equivalent months of income. Alternately, one could do the mortgage calculations and determine how much the prices translate to on a monthly basis (which would likely convert to a more reasonable number of pizzas per month).

This comic is in line with the much older 616: Lease and the more recent 1674: Adult regarding buying real estate and not feeling sufficiently grown-up to handle such an important transaction (see also 905: Homeownership).

#1895: Worrying Scientist Interviews

September 27, 2017



They always try to explain that they're called 'solar physicists', but the reporters interrupt with **"NEVER MIND THAT, TELL US WHAT'S WRONG WITH THE SUN!"**

Explanation

"Breaking news" is a phrase which describes news reports which are considered important enough to interrupt (or "break") scheduled broadcasts. The phrase is also often used to describe scheduled reports on important current events. When a new development in an active story occurs, news channels will often interview an expert in the field to educate laymen in what, exactly, is happening. Thus, when you turn on the local news and see a scientist being interviewed, it is likely that something new has come up regarding their field of study that could affect you.

How much it affects you could range from an interesting bit of information about your local area, to the complete annihilation of the human race. So, to help identify how serious the issue likely is, Randall has made this chart showing how worried you should be depending on the field of the scientist. A table has been arranged to explain the amount of worry needed for each field below.

To the far left, the least worrying are archaeologist and economist. An archaeologist studies ancient human civilizations, which would be unlikely to harm any modern person. Economists study and explain the trends of finances and resources, which are also unlikely to pose an immediate threat.[citation needed]

Following this, it shows nutritionists and eventually criminologists. A nutritionist studies nutrition in the

human body, and is likely discussing which food options are healthy or unhealthy. While this may be important, it is not a cause for immediate concern. A criminologist, however, studies criminal behavior. If a criminologist is being interviewed on the news, there is likely a change in criminal actions within the neighborhood, be it more or less. It is also possible there may be a serial criminal working in the area. However, because crime is a relatively rare occurrence, and one for which precautions can be taken, it is still unlikely to be an immediate threat to the viewer.

It then moves past researchers studying different types of organisms, before reaching astronomers. Still only very few events would be local regarding astronomy, but it could of course be regarding a pending meteor strike.

A virologist studies viral infections and their spread, and a vulcanologist studies volcanoes. Viruses spread quickly, and can be fatal, meaning a breaking news development in one's locale regarding viruses is likely to mean imminent danger. Volcanoes, depending on their size, can potentially demolish entire countries, thus having one making headlines nearby is also very concerning.

The last point to the right (most worried) "Astronomer who studies the Sun", also called a "solar physicist" (mentioned in the title text), could be really troublesome, but not especially locally. If there are serious problems with the Sun it will be a world-wide problem. But you should still be worried.

The title text mentions that the reason they are not called solar physicists, is that before they can tell the reporter this, they are interrupted by the anxious reporter who wishes to know what's wrong with the Sun. This is not really something that happens so often[citation needed] that the title texts "They always try" has any real meaning. And this is also why no one knows or uses the term solar physicists...

#1896: Active Ingredients Only

September 29, 2017



Contains the active ingredients from all competing cold medicines, plus the medicines for headaches, arthritis, insomnia, indigestion, and more, because who wants **THOSE** things?

Explanation

Commercial medicine typically has one (or a few) "Active" ingredient and many "Inactive" ingredients. Active ingredients are the actual medicine, while inactive ingredients -- such as preservatives, dyes, or binders -- are added to dilute the active ingredient to a healthy level and help the body absorb the dose of active ingredient.

Randall thus presents a pack of cold medicine that has "Active Ingredients Only". It has six active ingredients and no inactive ingredients. This might be a spoof of the current trend of advertising food as containing "no additives and no preservatives".

Cold medicines are commonly packaged in blister packs, with each dose contained separately, and vegans commonly open up gelatin capsules and discard the capsule, ingesting only the contents of the pill[actual citation needed] (note that this may not be safe. Please consult your pharmacist or doctor before doing this). By removing the inactive ingredients of the gelatin and the requirement to open it up, the slogan We're not here to waste your time, is justified.

The slogan is a registered trademark (®) while the product name is a common law or unregistered trademark (™). This means that the slogan likely stays the same, while the product name changes from time to time.

In the title text, the medicine company promises their product "Contains the active ingredients from all competing cold medicines, plus the medicines for headaches, arthritis, insomnia, indigestion, and more, because who wants THOSE things?" This may be a follow-up (or a wish from Randall) after 1618: Cold Medicine, where Cueball wishes to try all possible types of cold medicine at once. The provided justification for combining all these medications is simple: These medicines cure unpleasant symptoms, so taking them all must be a good thing. What this ignores is that taking medicine intended to solve symptoms one doesn't have can be potentially harmful, and would likely be unavoidable for this product's consumers unless they are suffering from all these conditions simultaneously. Furthermore, mixing medications can often lead to unintended reactions and side effects, and is typically advised against.

Another joke is that popular cold medicines contain no antiviral ingredients at all, and treat symptoms only -- while it might make your runny nose less runny, it will do just as much to clear the rhinovirus causing your runny nose as a sugar pill. This part of the comic may be a follow-up to 1526: Placebo Blocker, where a sugar pill is offered to treat a headache.

A secondary joke is by claiming the active ingredients from all "competing" cold medicines, the company producing this "Active Ingredients Only" may choose whom they say they are competing against. Some cold medications treat only pain and fever, for example, and

do nothing for cough, congestion, runny nose and sneezing. Doctors recommend medicines which aid for the particular symptoms of the cold one is experiencing.

#1897: Self Driving

October 02, 2017

TO COMPLETE YOUR REGISTRATION, PLEASE TELL US
WHETHER OR NOT THIS IMAGE CONTAINS A STOP SIGN:



NO YES

ANSWER QUICKLY—OUR SELF-DRIVING
CAR IS ALMOST AT THE INTERSECTION.

SO MUCH OF "AI" IS JUST FIGURING OUT WAYS
TO OFFLOAD WORK ONTO RANDOM STRANGERS.

"Crowdsourced steering" doesn't sound quite as appealing
as "self driving."

Explanation

This comic references the approach of using CAPTCHA inputs to solve problems, particularly those involving image classification, specifically reCAPTCHA v2's fallback puzzle, and hCaptcha's puzzle, both of which are based on identifying road features and vehicles. A reCAPTCHA version of this puzzle would ask "check all squares containing a STOP SIGN" using one or more images derived from Google Street View.

Such an approach can serve to create the learning set as the basis for training an artificial intelligence (AI) to better recognize or respond to similar stimuli. This approach was used by Google, the owners of reCAPTCHA, to identify house numbers in Street View to improve their mapping, and nowadays Google also uses CAPTCHAs to identify vehicles, street signs and other objects in Street View pictures. This might be a reasonable way to help improve the performance of the AI in a self-driving car that responds to video input, by reviewing images it might encounter and flagging road signs, etc. that it should respond to. Later a similar approach to learning important things, for the robots, was used in 2228: Machine Learning Captcha.

However, the temptation might be to simply sidestep the hard problem of AI by having all instances 'solved' by "offloading [the] work onto random strangers" through CAPTCHAs. For example, this has been used to defeat CAPTCHAs themselves; people were asked to solve

CAPTCHAs to unlock pornographic images in a computer game, while the solution for the CAPTCHA was relayed to a server belonging to cybercriminals. (See PC stripper helps spam to spread and Humans + porn = solved CAPTCHA).

Alarminglly, the developers of this 'self driving' car seem to have gone for the lazy approach. Instead of teaching an AI, the CAPTCHA answer is used in real time to check whether the "self-driving" car is about to arrive at an intersection with a stop sign. This information is pretty critical, as failing to mark the stop could cause an accident. The user is unlikely to respond to the CAPTCHA in time to avert disaster, not to mention that any interruption to the car's internet connection could prove fatal. Self driving cars have become a recurrent theme on xkcd.

The system depicted is a Wizard of Oz experiment (as is the "Mechanical Turk" which a popular crowdworking system is named after) whereas actual self-driving cars, to the extent that they can use reCAPTCHA-style human detection systems, would involve an asynchronous decision system. Other synchronous decision systems which actually exist are political voting and money as a token of the exchange value of trade.

The title text explains that this method could be called "crowdsourced steering", crowdsourcing meaning sending the data on the internet to let several users provide their ideas and input on a problem. People would naturally suspect that this is considerably less safe

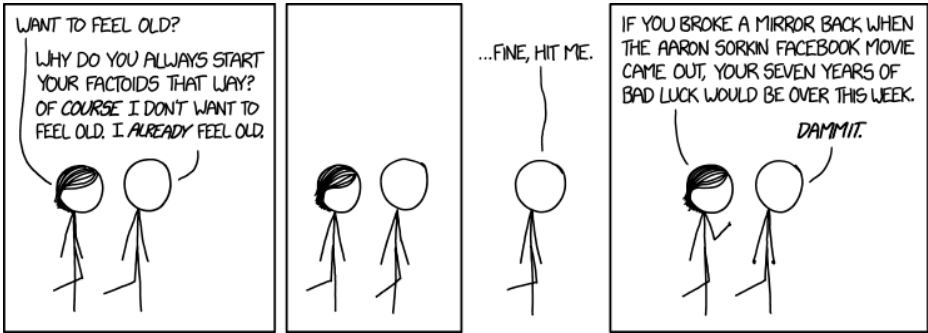
than a car which is actually capable of self-driving; if the internet can barely collectively steer a videogame character, what chance do they have steering an actual, physical vehicle?

This also suggests that Randall is a bit skeptical of the current stage of AI, as this doubts whether the AI technology really is working in the way that we expect. It also comments on how what we call 'progress' actually is putting our work onto other people.

As of November 2024, reCAPTCHA v2 is beaten.

#1898: October 2017

October 04, 2017



And yet I have no trouble believing that the start of the 2016 election was several decades ago.

Explanation

Randall once again makes us feel old by referencing an old movie that would feel recent to someone at the time. The movie in question is *The Social Network*, written by Aaron Sorkin and directed by David Fincher, which was released seven years and three days prior to this comic, on October 1, 2010.

In the comic, Megan introduces her factoid with a typical opener of "Want to feel old?". Cueball points out that this is obviously a rhetorical trick to secure his engagement, as nobody truly wants to feel old. However, he still succumbs to the trick due to morbid curiosity - while he doesn't want to feel old, his desire to know the factoid is too great.

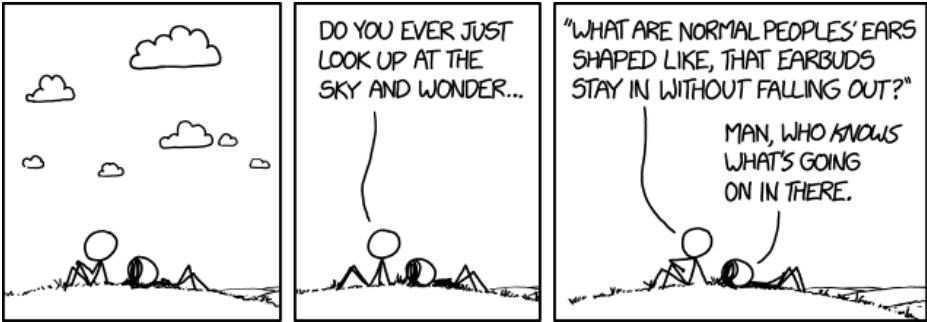
Megan tells Cueball that, had he broken a mirror when *The Social Network* was released, his seven years of bad luck would now be over. This is a reference to an ancient superstition that breaking a mirror causes seven years of bad luck. For the purposes of Megan's comparison, however, it provides a more dramatic way to express "seven years ago", which makes the impact of that length of time land harder than it otherwise would. Cueball thus immediately regrets his curiosity.

A mirror was previously broken by Black Hat in 1136: Broken Mirror. However, as of October 2017, there were still 2 years of bad luck remaining from that breakage.

The title text alludes to an opposite effect: even though the 2016 US presidential election was relatively recent (11 months ago) at the time of this comic, Randall/Cueball has somehow convinced himself that the event has been going on for decades. This alludes to the fact that Donald Trump's tumultuous presidency has so far been so stressful and eventful that the election feels like it took place far longer than 11 months ago. In psychology, this effect is called Backward telescoping, which causes people to overestimate the elapsed time since an event.

#1899: Ears

October 06, 2017



My theory is that most humans have been colonized with alien mind-control slugs that hold the earbuds for them, and the ones who can't wear earbuds are the only surviving free ones.

Explanation

Cueball and Megan are sitting in a park together and appear to be cloudwatching. Cueball asks if Megan has ever looked up in the sky and wondered, suggesting that he is thinking deep thoughts while allowing his mind to wander, what "normal" people's ears are shaped like; that their earbuds stay fitted inside their ears instead of falling off. It is possible, but not evident, that Cueball is listening to some audio device through earbuds, and his wondering is caused because he looked up at the sky and they fell out, leading to his thoughts about what it would be like to have "normal shaped ears" that would allow him to wear earbuds without this happening. (This joke is directed towards a large group of people who cannot use earbuds successfully because they fall out.) Megan's response could either be making fun of Cueball (whatever goes on in his head with the random conversation points he tends to bring up) or agreeing with him that earbud wearers' ears are mysterious.

The comic appears to be a variation on a famous and oft-quoted fragment from Voltaire's satirical novella *Candide*, wherein Dr. Pangloss states that we live in 'the best of all possible worlds', among other reasons because '...noses were made to wear spectacles, and so we have spectacles'.

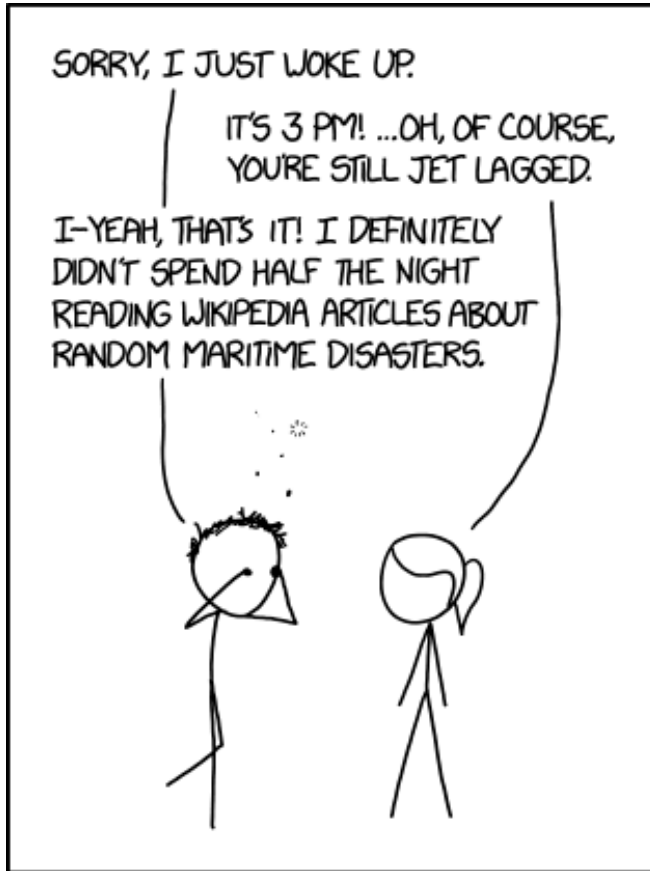
The title text is a play on conspiracy theories wherein the human race is being assimilated by aliens, and the person coming up with the conspiracy theory thinks he is one of

the few "free" survivors. The use of "brain slugs" in particular may be a reference to the Animorphs book series, a nostalgic favorite of Randall's, in which humanity is being colonized by parasitic alien slugs called Yeerks, that enter a human's brain through the ears and can control them. Randall/Cueball here may be suggesting that the reason most humans can wear earbuds is because the Yeerks hold the earbuds in place.

Another possibility, given the earbud/music reference, is that Randall is making a joke about earworms.

#1900: Jet Lag

October 09, 2017



I LOVE TRAVELING, BECAUSE MY SLEEP SCHEDULE IS AS MESSED UP AS ALWAYS, BUT SUDDENLY I HAVE AN EXCUSE.

I had some important research to do on proposed interstellar space missions, basketball statistics, canceled skyscrapers, and every article linked from "Women in warfare and the military in the 19th century."

Explanation

Jet lag is a physiological condition widely attributed to the effect of changing one's longitude fast enough that one's "body clock" is unable to adapt to the official clock. (The actual causes are somewhat more complex, and may be influenced by the cramped conditions on the airplane.

The effect of travel between the east coast of North America and the west coast of South America, which are at nearly the same longitude, and differ by only one hour in official clock time, is much more severe than the effects of setting clocks ahead an hour in the spring and behind an hour in the fall. Some White House staffers get jet lag when they travel on commercial flights but not when they travel on Air Force One.) Symptoms include a sleep cycle which does not match the solar cycle as it usually would.[citation needed]

Hairy, representing Randall, has just woken up at 3 o'clock in the afternoon, and Ponytail mentions he must be still jet lagged (possibly from a recent trip). Hairy then denies much too specifically that he has actually been up to some late-night Wikipedia browsing and reading about maritime disasters.

In the caption Randall confesses that he loves traveling, because he can then use jet lag as a nice excuse for what is actually his usual messed up sleep cycle.

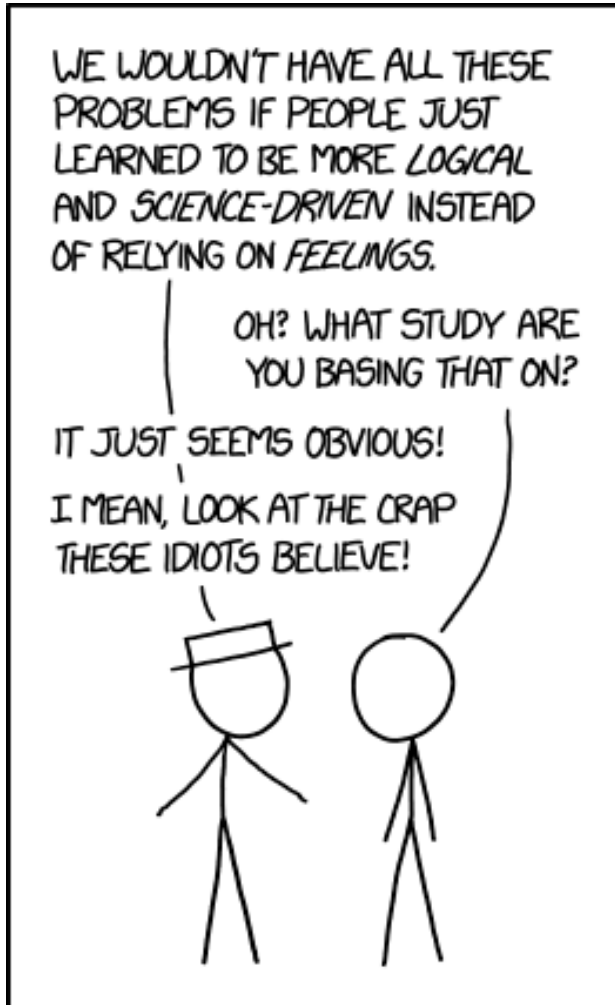
In the title text, Randall states that he had to do some important research. But what he lists, are clearly also just

topics he read in Wikipedia: proposed interstellar space missions, basketball statistics, canceled skyscrapers, and every article linked from "Women in warfare and the military in the 19th century." Randall has earlier illustrated this issue in 214: The Problem with Wikipedia.

Randall has previously discussed his oft-changing sleep cycle in 320: 28-Hour Day and 448: Good Morning, and has alluded to it more subtly in 68: Five Thirty, 92: Sunrise, and 776: Still No Sleep. We can thus see that this is a habit of Randall's that has persisted for more than a decade, as has his obsession with Wikipedia.

#1901: Logical

October 11, 2017



It's like I've always said--people just need more common sense. But not the kind of common sense that lets them figure out that they're being condescended to by someone who thinks they're stupid, because then I'll be in

trouble.

Explanation

White Hat says that problems in society could be avoided if people relied on logic and science rather than feelings—but when Cueball presses him to back up his claim, White Hat insists that his claim must be true, because it just seems obvious (to White Hat), and what the opposition (which he dismissively refers to as "these idiots") believes is crap in his opinion. Since White Hat refers to all people in general and since he falls in the same trap as he complains about, using his feelings for his case instead of logic and science, White Hat's argument is both fallacious and hypocritical.

The title text is White Hat's opinion, where he states that he has always said that people just need more common sense. He then adds, but not the kind of common sense that lets them figure out that he is condescending (i.e. talking down to them) and basically thinks that they are stupid. If they did, they would probably realize that White Hat considers himself smarter than them, and likely feel insulted and take retribution. (At the same time, he may himself lack this form of "common sense," as Cueball's question could be seen as a veiled insult highlighting White Hat's hypocrisy.)

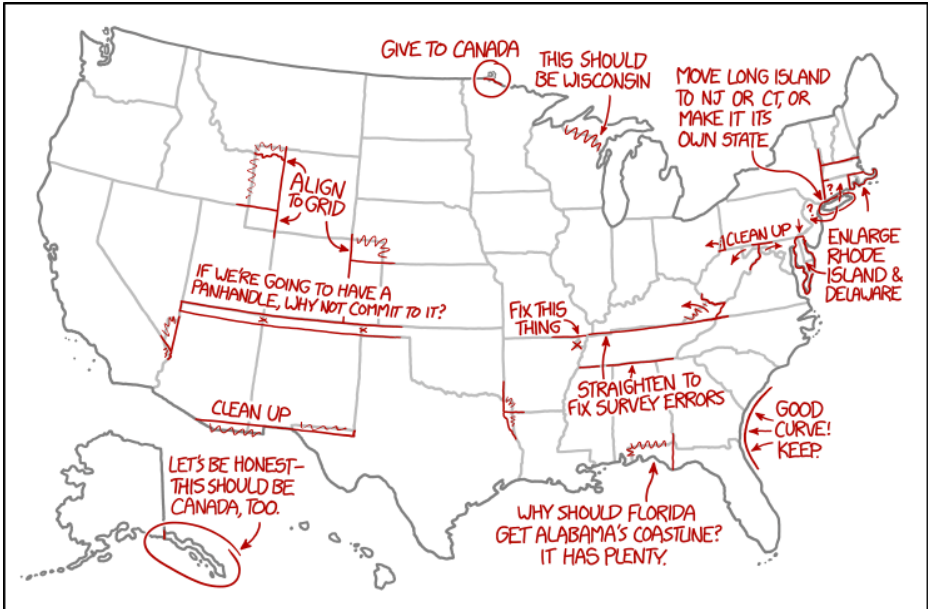
When people talk about "common sense", they often really mean "they should think like I do". Using a term like "common sense" as a proxy for one's personal point of view implies that everyone else should have the same point of view. This discredits the fact that each person

has their own point of view, completely valid to their own mind, and any attempts to push someone else's idea of a "common sense" upon them usually feels like "being talked down to" because of the implicit "fact" that that person's point of view is "common" and makes "sense", and therefore they must be smarter than you if you don't agree with their "common sense".

Ironically, there is some inconclusive scientific evidence against White Hat's position. It is possible that effective rational thought depends on feelings and emotions as a preprocessing step. For example, people with damage to the ventromedial prefrontal cortex lose their ability to have gut reactions to decision options. In Antonio Damasio's research, they were unable to make good decisions in everyday life. This may be because every option seems emotionally as good as any other and the brain is not good at conscious processing of large numbers of alternatives. See Descartes' Error by Damasio (1994) and The Righteous Mind by Haidt (2012).

#1902: State Borders

October 13, 2017



IT WAS SCARY WHEN THE GRAPHIC DESIGNERS SEIZED CONTROL OF THE COUNTRY, BUT IT TURNED OUT THEY JUST WANTED TO FIX SOME THINGS ABOUT THE STATE BORDERS THAT HAD ALWAYS BOTHERED THEM.

A schism between the pro-panhandle and anti-panhandle factions eventually led to war, but both sides spent too much time working on their flag designs to actually do much fighting.

Explanation

In this comic, graphic designers take control of the United States, but the only thing they do is to change the state and national borders, using primarily aesthetic criteria, see details in the table below. State and national borders have generally emerged from some combination of political decisions, natural boundaries, control of natural resources, and, to some degree, from chance. As the comic implies, some borders originally resulted from surveying errors, but became encoded by law and tradition, and thus were never changed.

Despite the caption's rather blasé reaction to the graphic designers' master plan, the changes they propose could be rather tumultuous. Political boundaries are difficult to change because rewriting them places entire populations in different states or even different countries. Even within the US, changing a population from one state to another has serious implications. A different state means different laws, tax obligations, public benefits, business regulations, infrastructure support, etc. It would also mean that control of some very substantial natural resources would be transferred from one state to another. More significantly, the suggestion to cede portions of the US to Canada and Mexico would be a much bigger deal, forcing residents of those areas to either leave their homes, businesses, and communities or surrender their current nationality and apply for citizenship in another country. The joke behind the comic is that graphic designers would tend to ignore these practical concerns

and pay more attention to a map looking orderly.

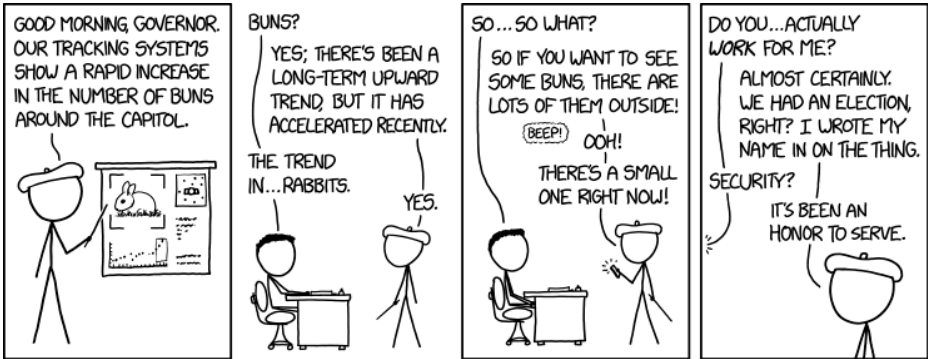
This comic hints at the fact that Randall actually wants to see these changes made, since there have been other comics containing red annotations over a complex and established structure that he wants to change.

In the title text, the graphic designers have a civil war between the ones that favor "panhandles" in the borders (such as the Oklahoma one which is enlarged in the map, the Florida one which is removed in the map, and maybe others such as the Texas region known as the "Texas panhandle") and the ones that don't. However, as graphic designers, they get too caught up in making the flag designs for their faction to actually fight. Randall has shown interest for vexillology (the study of flags) in the past, such as in 1815: Flag.

Table of changes[edit]

#1903: Bun Trend

October 16, 2017



Our experts have characterized the ecological impact of this trend as "adorable."

Explanation

In this comic, Beret Guy takes his bun shenanigans to the state government, reporting to the governor that the number of buns around the capitol has shown a rapid increase. The governor is confused, then finally comes to grasp that Beret Guy is talking about rabbits, lots of which can be seen if he would just go outside (by the way, there is a small one RIGHT NOW!).

Elections in the United States often have a blank spot on the ballot for the voter to write the name of a write-in candidate. Beret Guy thinks he works for the governor because he wrote his name in on the ballot. This does not mean that he actually works for the governor.[citation needed]

The governor finally takes appropriate action by calling security, and Beret Guy confronts his fate with poise and honor. Indeed, the readiness with which he accepts his removal almost seems to suggest that he doesn't belong, which would be an unusual level of awareness for his character. Alternatively, Beret Guy might have misinterpreted the governor's request for security as a question of whether he works in security, or simply ignorance.

Beret Guy's uncertain position in the government is very similar to the way he treats and operates his business.

"Buns" have been mentioned previously in 1682: Bun

and 1871: Bun Alert.

It is likely that Beret Guy is using the aforementioned Bun Alert app to measure the rabbit population. If this is the case, the recent increase in alerts may simply represent an increase in people using the app, rather than an actual increase in the rabbit population - a common fallacy. One simple way of correcting for this is to divide the total alerts by the number of active users during each interval; a change in this value would indicate that the bun population is actually changing.

In countries where rabbits are an invasive species or crop-destroying pests, an increase in rabbit populations may be of concern. In the title text, however, experts characterize the ecological impact of a large number of bunnies as "adorable" instead of giving information on how the rabbits are affecting the environment.

#1904: Research Risks

October 18, 2017



The 1919 Great Boston Molasses Flood remained the deadliest confectionery containment accident until the Canadian Space Agency's 2031 orbital maple syrup delivery disaster.

Explanation

This is a comparison of the possibility of the subjects of various sciences being a threat to humanity. It can either be an autonomous threat to the local population (i.e. by escape from a lab), or as part of a supervillain's scheme to rule the world.

In general, areas of study that could be used by supervillains, but are unlikely to "break free" refer to technologies that are unlikely to be self-propagating or self-maintaining, but could be used as weapons or for some other form of control. Subjects that could break free, but are unlikely to be used by supervillains are all living organisms (which could presumably breed and multiply without human intervention), but which have little potential as weapons. Areas of study that fall in both categories are either more controllable forms of biology (microbiology, genetic engineering), forms of technology that could become self-propagating (robotics), or a study where a release could be dangerous without being self-propagating (chemistry).

The category of a low risk of either could, of course, contain many fields of study, as most research fields have limited potential for weaponry and little danger of going out of control on a large scale. See the chart below for detailed explanations of each scatter point. There have so far been several similar comics with such scatter plots. See for instance 1242: Scary Names, 1468: Worrying, 1501: Mysteries and 1701: Speed and Danger.

The title text is related to the Molasses Storage entry at the bottom left of the chart, and references the Great Molasses Flood, also known as the Great Boston Molasses Flood. It occurred on January 15, 1919 in the North End neighborhood of Boston, Massachusetts (the state in which Randall lives). A large molasses storage tank burst and a wave of molasses rushed through the streets at an estimated 35 mph (56 km/h), killing 21 and injuring 150. The joke in the title text is that in 2031 (14 years after the release of this comic) the Canadian Space Agency has an even more serious disaster, which will be known as the orbital maple syrup delivery disaster. The title text claims that this disaster then became the deadliest confectionery containment accident, thus killing more than 21 people.

Table[edit]

Note: percentages refer to the position of the center of the smallest enclosing rectangle around each name. 0% and 100% correspond to the low and high arrow tips, respectively.

#1905: Cast Iron Pan

October 20, 2017



If you want to evenly space them, it's easiest to alternate between the Arctic and Antarctic. Some people just go to the Arctic twice, near the equinoxes so the visits are almost 6 months apart, but it's not the same.

Explanation

White Hat is discussing tips for maintaining Cast-iron cookware. Cast-iron cookware is well-loved and often promoted by cooking aficionados, but requires more effort and care to maintain than many other modern forms of cookware. This strip satirizes both the amount of effort involved, and the attitude of connoisseurs who look down on people who are unwilling to put in such effort. In typical xkcd fashion, the comic starts off somewhat realistic and escalates to absurdity.

1st Panel[edit]

White Hat tells the old myth (debunking articles: Lifehacker, The Kitchen, Serious Eats), that "you shouldn't wash your cast iron pan with soap since it destroys the seasoning", to Cueball. Seasoning is the process of treating the surface of a pan with a stick-resistant coating formed from polymerized fat and oil on the surface. Although it may not be a problem to use soap on your seasoned cast iron pan, you should still proceed with care with how you treat it.

2nd Panel[edit]

White Hat starts to exaggerate; he tells him that if he ever as much as let soap touch the pan he should just throw it away, as that fact alone would prove that he would not be up to taking care of such a precious possession. This is a kind of scare tactic that might make Cueball believe this and anything else he tells him.

3rd Panel[edit]

White Hat continues to give dubious advice to the point of absurdity, and Cueball becomes more and more wary of it.

His next word of advice is to apply moisturizer to the pan daily to keep it fresh. Cueball asks why and is told that it is to avoid the pan getting wrinkles. This implies that the pan would age like a human and get wrinkles. This is, of course, nonsense, but Cueball is not yet ready to dismiss White Hat's advice.

4th Panel[edit]

The final piece of advice is that twice a year Cueball should fill the pan with iron filings and leave it in direct sunlight for 24 hours. Both details are intended to be absurd. For one, neither the iron filings nor the sunlight appear to serve any actual purpose. Second, 24 continuous hours of direct sunlight is impossible to achieve in most places. North of the Arctic Circle (often shortened to simply "the Arctic") there will be at least one day a year where the sun does not set. While one might assume that a combined total of 24 hours over couple of days would be sufficient, White Hat implies that it's necessary to travel to very remote locations in very specific parts of the year to meet an extreme requirement. He further casts an unwillingness to meet this unreasonable standard as rendering a person unworthy of cast iron.

White Hat's strict tone "If you're not willing to travel to the Arctic, you don't deserve cast iron" might also suggest that cast iron is a special almost-legendary metal similar to Damascus steel or its fictional counterpart Valyrian steel and requires distant travel to obtain/maintain. This is likely a parody of the level of reverence cast iron cookware tends to receive in certain circles.

Despite there being alternatives that are much easier to maintain, a significant number of cooks insist that cast iron has qualities that make it worth the amount of effort involved.

Title text[edit]

In the title text, White Hat mentions that, if you wish to evenly space the two 24 hours of sun each year, it is easiest to alternate between the Arctic and the Antarctic regions. But this will mean that you have to travel a long distance at least once a year; even if you already lived inside one of the Polar Circles, you would have to travel to the other at least once a year.

It is implied that you do not have to space them evenly. As he mentions, some people just go to the Arctic twice a year near the equinoxes. However, according to White Hat, this is not the same, probably because it doesn't lead to an exact six-month spacing and the sun would stay very low on the horizon and the sunlight would not be as intense.

In order to accomplish this other scheme, it also means that they would actually have to go very close to the North Pole (or South Pole), as this is the only place with midnight sun around the equinoxes. So, in principle, this would be much more cumbersome than just going inside the southernmost part of the Arctic region at the summer solstice, and similarly the northernmost part of the Antarctic region at the northern hemisphere's winter solstice (which will be the summer solstice in the southern hemisphere).

When looking at it like this, it may seem that White Hat actually means that you should always go to the poles, rather than just to a place with 24 hours of sunlight, in order to have the sun high in

the sky as well.

#1906: Making Progress

October 23, 2017

I STARTED THE DAY WITH
LOTS OF PROBLEMS.

BUT NOW, AFTER HOURS
AND HOURS OF WORK,

I HAVE LOTS OF PROBLEMS
IN A *SPREADSHEET*.



I started off with countless problems. But now I know, thanks to COUNT0, that I have "#REF! ERROR: Circular dependency detected" problems.

Explanation

Megan has procrastinated made progress on a large backlog of problems. While she started the day with lots of problems, she has entered those problems into a spreadsheet. While this could potentially allow her to tackle her problems in a more organized way and fix them more quickly, the humor lies in that none of the problems have actually been solved. Additionally, it's questionable whether this was worth the hours of effort she put into making the spreadsheet, and even whether the spreadsheet has made her problems any easier to tackle in the first place. The comic questions the usage of spreadsheets for anything beyond organization.

In the title text she reveals that even her spreadsheet has a problem, because "#REF Circular Dependency detected" is a spreadsheet error meaning that a formula is (possibly indirectly) using its own cell in the equation. This is probably because she has used the Count() function to find the number of problems to be solved, but since one of those problems is not knowing how many problems she has, it is trying to include itself in the count.

This counting problem may also be a metaphor for circular dependencies within the problems themselves, such that a solution to one problem would help solve another problem, but solving the first problem depends on a solution to the second problem (e.g. organizing a cluttered mess of objects requires room to work, which is not available because of all the clutter).

Arguably, this has introduced a further problem, so she actually now has (#REF Circular Dependency detected)+1 problems. It's also possible, since Megan has chosen to interpret the error message as a numeric value representing the number of problems she has, that she is simply not good at using her spreadsheet software, which may be another problem that needs adding to her list. The use of COUNT() has, rather than returning an exact amount of problems to solve, implied that her original problems cause so many more that she does indeed have "countless problems".

The error shown is similar to two different errors in the popular spreadsheet program Microsoft Excel: #REF!, which means that an invalid reference has been made (such as to a cell or sheet that has since been deleted), and circular references, which means that a certain cell's content has been made to depend, at some stage, on its own content, recursively. The latter could be because it directly refers to itself, or because it refers to another cell which, in some way, refers back to it. Most versions of Excel do not show circular references in the cell, next to where a #REF! error would be; rather they show an error message box and arrows drawn over the sheet which connect the dependencies of the cells involved in the error. However, since the comic does not specify which spreadsheet software Megan is using, Randall can simply make the errors up, to make the joke more quickly understandable, while clearly referencing errors that show in actual spreadsheet software.

#1907: Immune System

October 25, 2017



BUSINESS PROTIP: YOU CAN STRENGTHEN ANY
PRESENTATION BY OPENING WITH A REMINDER
ABOUT HOW COOL IMMUNE SYSTEMS ARE.

It also helps with negotiation. "Look, if it were up to me, *I'd* accept your offer, but my swarm of autonomous killer cells literally can't be reasoned with. It's out of my hands!"

Explanation

In this comic, Ponytail is delivering an informative report to a group of listeners, likely important managers of some large company. She begins her lecture by stating she is the host of a microscopic autonomous swarm that will do anything to protect her. She is referring to the immune system, which could technically be defined as a "microscopic autonomous swarm" that will do anything to protect her -- i.e. destroy pathogens such as viruses and bacteria, both of which cause multitudinous diseases in humans. Like many of the systems of the body, the immune system cannot be controlled by conscious thought, and should not be taken as unordinary.

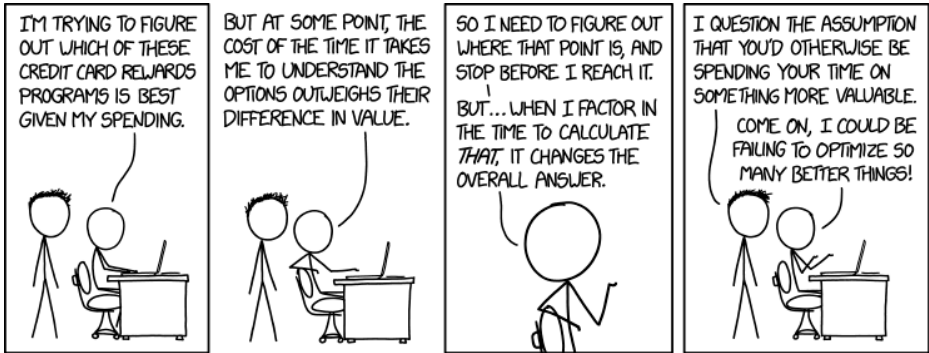
The caption below reveals the method behind her madness. Randall claims that beginning any business presentation with a surreal description of one's own immune system is guaranteed to strengthen your case. Whether or not this is actually the case is irrelevant, the point of the comic is about "how cool the immune system is", and explains its coolness through an unconventional description of how the process works. Additionally, Ponytail's description implies more potential power over external entities than an immune system typically has, perhaps to gain more respect/fear from the speaker's audience.

The title text elaborates further on this, stating that similar arguments can be used in negotiation. The description of the immune system is deliberately

misleading, implying that the immune system may attack the other negotiator if the terms of the deal aren't satisfactory. While it is correct that your immune cells cannot be reasoned with[citation needed] and theoretically it could cause an anaphylactic shock in the targeted organism, the veiled threat omits the fact that the immune system 1) is unaffected by external negotiations conducted by its host, 2) is incapable of attacking things outside of the body, and 3) would have to overcome the target's own immune system.

#1908: Credit Card Rewards

October 27, 2017



I should make a list of all the things I could be trying to optimize, prioritized by ... well, I guess there are a few different variables I could use. I'll create a spreadsheet ...

Explanation

A credit card, at its most basic form, is a loan contract to an individual from a bank. Like all contracts, the bank will offer several different types in an attempt to appeal to a large number of individuals. Unlike traditional loans which focus on a single item (car, house, boat, etc), a credit card is an unsecured loan geared towards daily and weekly transactions. Because these transactions cover a wide variety of items, credit cards can be further tweaked towards offering benefits in certain areas. For example, gas purchases, or even gas purchases through a single retail chain, can offer higher rewards on one type of plan vs. other plans.

These benefits, typically called rewards, have several different options. "Cashback" is a reward where the individual is given money back when they make a purchase that follows certain rules spelled out in the contract. "No interest" is a reward where the individual is not charged interest on their purchases if they pay the loaned money back within a specified amount of time. "Points" are similar to the cashback program, but are typically reserved towards purchasing a single large item or plan. Points towards a vacation is a popular option. Besides these three types of rewards, the number of actual rewards to pick from are limited only by the creativity and fiscal limitations of the issuing bank.

Cueball is trying to choose the optimal credit card program that will result in the biggest savings for his

typical income and spending patterns. He will need to trade off the value of any benefits against the cost of any fees and interest charges that would be incurred. This could become quite complex if he is prepared to consider taking out multiple cards to access the various benefits they offer, and in order to get the best outcome he may need to regularly shift funds from one card to another to make use of introductory or short-term offers. On top of all this, the incentives on offer may change his spending behavior, which would further impact the calculation. (This table was actually created in 1205: Is It Worth the Time?)

He then realizes that there is a cost of him spending time on optimizing his choice, so he wants to limit the time spent doing the optimizing so that it doesn't outweigh the maximum advantage he might gain from choosing the best deal. Finding a definite answer to the time at which he should stop his optimization efforts is hard, if not impossible, because the fact that he cannot complete them means that he probably cannot know for certain what the maximum advantage would be; he will have to rely on a probabilistic solution instead. To further complicate things, he will need to factor in the cost of the time spent solving the problem of how long to spend on optimizing (and, presumably, the time spent solving that problem, and so on infinitely).

Hairy challenges a hidden assumption that Cueball's time has significant value, which would imply that if he wasn't worrying about this problem, he would be doing something more productive, implying that Cueball's

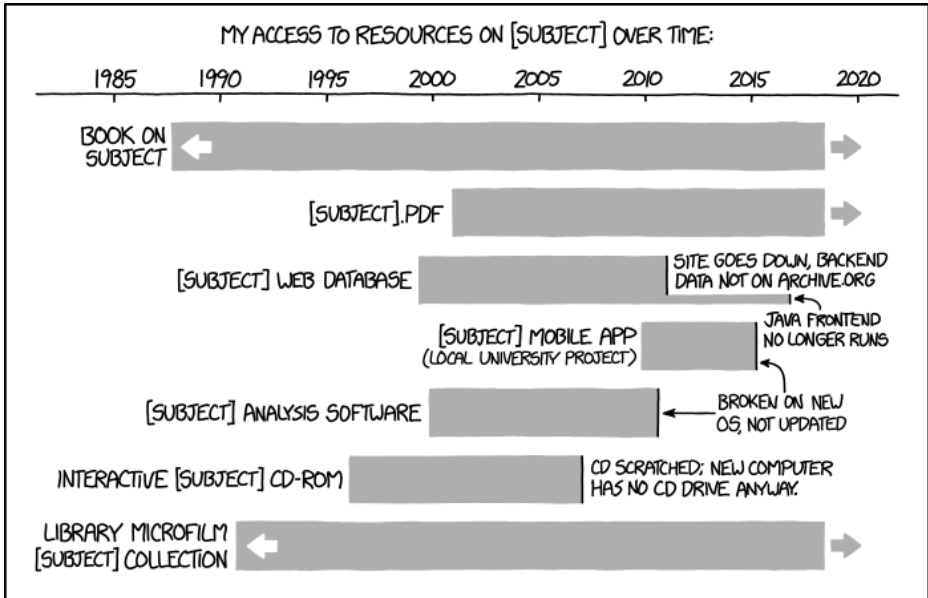
obsession with optimization is lame enough to suggest that he does not actually have any more worthwhile interests to pursue. His response that he "could be failing to optimize so many better things!" just further proves Hairy's point, and suggests that Cueball is aware of both the big flaw in his reasoning and the fact that, when he attempts to optimize things, it seldom really helps his situation.

The title text further expands the idea. Cueball wants to work out which optimization problems he could most productively work on first. However, his proposed idea of creating a spreadsheet to calculate this may well end up costing more in time than the benefit he would gain from working on them in priority order (particularly since, on this evidence, the potential gains from each problem are marginal at best). Furthermore, if the 'several variables' he needs to consider lead to the kind of complexity seen in the credit card problem, a spreadsheet may not be the best tool for the kind of calculations he needs to perform.

The idea of spending more time organizing tasks in a spreadsheet than you actually do working on the tasks was previously featured in 1906: Making Progress.

#1909: Digital Resource Lifespan

October 30, 2017



IT'S UNSETTLING TO REALIZE HOW QUICKLY DIGITAL RESOURCES CAN DISAPPEAR WITHOUT ONGOING WORK TO MAINTAIN THEM.

I spent a long time thinking about how to design a system for long-term organization and storage of subject-specific informational resources without needing ongoing work from the experts who created them, only to realized I'd just reinvented libraries.

Explanation

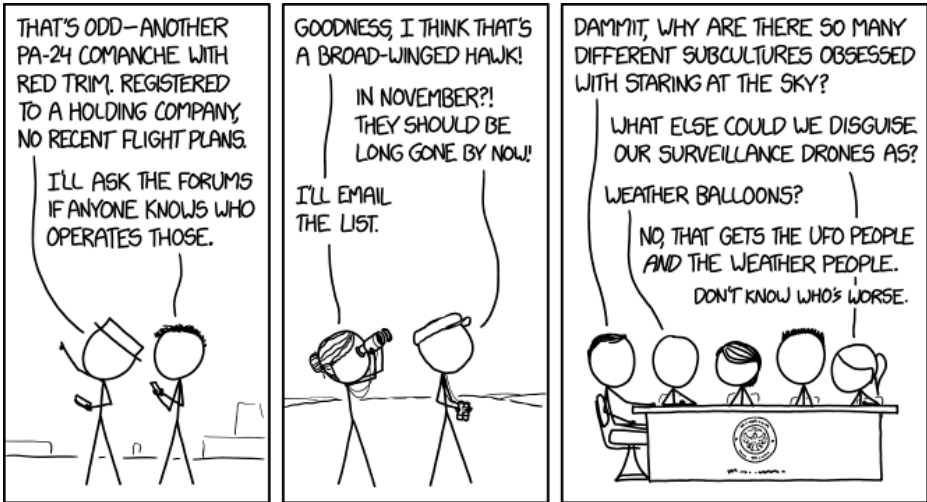
In this chart, Randall laments the tendency of digital resources to quickly become obsolete or non-functional. By taking a general subject, such as xkcd's core subjects of "romance, sarcasm, math, and language", one can see that a useful tool such as a smartphone or computer app or interactive CD-ROM (essentially, software) does not have the lasting power of printed books (e.g. textbooks, for many general subjects) and microfilm/microfiche. The printed resources, not having to rely on a computerized platform for use, are far more reliable despite being less mobile and taking up physical space. The only digital source which is still working is Portable Document Format (aka PDF) which encapsulates fixed layout flat documents, and is supported for years already by Adobe Systems and is part of ISO standards, so has a widespread support, and should be still viewable in foreseeable future.

Archive.org refers to The Internet Archive, a non-profit organization that maintains the Wayback Machine, one of the largest archives of the World Wide Web. When a website is taken offline, copies of its content can often be found backed-up on the Wayback Machine. The Wayback Machine is primarily designed to back up websites, however, and will often not be able to save information stored in a site's databases, as alluded to in the comic. The Internet Archive has a part for non-website archives, but it cannot hold recent databases either due to copyright problems.

The title text makes a statement that libraries do not require the support of original authors/experts to organize and store vast resources for any subject imaginable. This is true, but omits the fact that ongoing efforts are required by experts in information organization and storage -- namely, librarians. Physical books and microfilm/microfiche need controlled storage environments, manual handling for storage, retrieval, distribution (in library terms, "circulation"), and the like. Thus, a library can require significant resources in personnel and facilities, but is usually seen as a "public good" for the benefit of society; thus, many communities and educational institutions invest in creating and maintaining a library despite the costs.

#1910: Sky Spotters

November 01, 2017



Where I live, one of the most common categories of sky object without a weird obsessive spotting community is "lost birthday party balloons," so that might be a good choice—although you risk angering the marine wildlife people, and they have sharks.

Explanation

This comic explores how people with various hobbies notice strange things in the sky.

In the first panel the plane enthusiasts White Hat and Hairy notice that there is a Piper PA-24 Comanche in the sky (apparently the most recent of several), belonging to a holding company that has filed no flight plans. Flight plans do not need to be filed for many short flights at lower altitudes in good weather, so for a small aircraft like the PA-24, the missing flight plan alone should not be unusual. Many government or company planes used for secret purposes, like FBI planes registered to fake companies, go a step further and are blacklisted from major databases. Regardless, it makes White Hat and Hairy wonder why, enough that they decide to post about it on their plane spotter forums. (See 1669: Planespotting). The reference to red trim on the Piper PA-24 Comanche could be a reference to the livery of Janet Airlines which operates clandestine flights between Las Vegas, Area 51, and other desert military bases, although these planes are in fact registered to the Department of the Air Force, rather than a holding company.

In the second panel Hairbun and a male bird enthusiast are wondering why there is a broad-winged hawk in the area in November when many broad-winged hawks should have migrated south to areas like Florida and Central America. They decide to send a message to their

birdwatching e-mail list. (See 1824: Identification Chart and 1826: Birdwatching). The two birdwatchers in this panel look like the old version of Cueball and Megan in 572: Together.

In the last panel, a committee from what appears to be the National Security Agency wonders how to disguise their drones so that people will not pay attention to them. The boss at the end of the table is lamenting the fact that both their bird- and plane-disguised drones have been noticed because of all these people constantly checking out the sky, also indicating that there are even more subcultures who are obsessed with things in the sky than the two mentioned already. Ponytail asks what else they could disguise their (secret) surveillance drones as, and Cueball suggests a weather balloon. But Ponytail shoots this down (no pun intended), since such a disguise would attract both the UFO enthusiasts and the "weather people" (presumably some regulation board that checks unauthorized use of meteorological survey balloons, or otherwise hobbyist meteorologists or perhaps even members of the Cloud Appreciation Society). She then jokes that she doesn't know which is worse. Since most people consider UFO enthusiasts to be into conspiracies, the "weather people" may be annoyed by this. Maybe Randall is indicating that people trying to predict the weather are correct as often as those claiming to have seen a UFO...

There are numerous instances of weather balloons being labeled as UFOs by enthusiasts, one of the most notable being the Roswell UFO incident, which for years was

explained by the US military as a weather balloon crash, but turned out to be a nuclear test surveillance balloon. It is now known as the most thoroughly debunked UFO claim.

In the title text, it is suggested that "lost birthday party balloons" should not attract too much attention. But then it is noted that it might make marine wildlife people angry, their concern probably being that balloons ultimately end up in some water body, which causes marine wildlife to get trapped in plastic and other synthetic material that was dumped in the water (see Marine debris). "Marine wildlife people with sharks" may be a reference to 585: Outreach, which also features a balloon carrying a shark. Another possible issue with disguising drones as "lost balloons" is that such balloons are quite rarely seen, and a sudden increase in the number of "lost balloons" seen would certainly raise suspicion even without a "spotting community" that focuses on them.

Among other types of people looking at the sky, the comic doesn't even get around to mentioning the subject of comic 1644: Stargazing. It also fails to mention that something could be disguised as a regular cumulus cloud, which is usually ignored by the average person.[citation needed]

#1911: Defensive Profile

November 03, 2017



NO DRAMA ZONE -> If I've made you sad, you'd better not tell me, because I am **TERRIFIED** of that situation and have **NO IDEA** how to handle it.

Explanation

This comic demonstrates a theoretical feature which provides more honest interpretations of social media profiles. We see a profile for a person who says they have “no filters” and has no qualms about offending or upsetting anybody with their seemingly radical views. But the “translation” of the description reveals that it is a vastly insecure person who seems to have the problem of saying the wrong thing every time and so their profile description is a way for them to justify their comments.

The title text continues, with the aggressive “NO DRAMA ZONE” turning out to mean that the user is merely trying to keep any offended or genuinely upset comments away from their page because they simply have no idea how to emotionally handle hurting someone’s feelings.

Randall previously demonstrated another theoretical feature to address passive-aggressive behavior in 1085: ContextBot. And show Cueball having the same feeling in 1984: Misinterpretation.

The comic’s feature may be based on the context menu option of the Google Chrome web browser to have a foreign language webpage translated to the user’s selected native language. However, in Google Chrome, the user may only translate the entire page, while in this comic the user may also select some text and have only the selected part translated. Also, Google Chrome uses Google

Translate for translation by default, which cannot read minds like in the comic yet (though it might be able to someday, given how much information Google has control over). However, if one uses the official Google Translate extension for Google Chrome, one may actually translate only the selected text. It is possible then that it is instead the extension which inspired the comic's feature.

This comic not only illustrates such a feature, but implies that the "translated" thoughts are what's actually going on behind posts of these types on social media, as if Randall can actually read those people's minds somehow. If this implication is the intent of the comic, then Randall thinks that people who have "no filter" are actually insecure and that people who want "NO DRAMA" are actually afraid of upset comments. Alternatively, Randall hates people who post such things in their profiles, and therefore wants to belittle them in this comic as actually being insecure, rather than being as confident as their aggressive behavior implies. This explanation is corroborated by notable news near the comic's publishing time (see below).

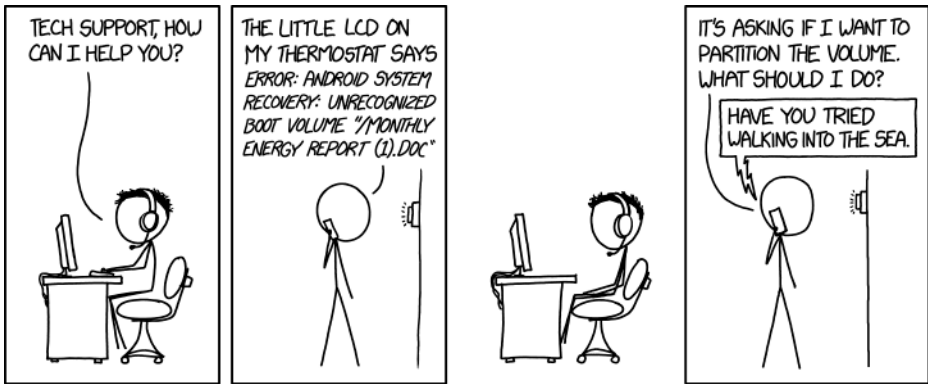
The style of the profile showcased in the comic resembles the profiles of the popular social media website Twitter, which while the user is logged in, shows the user's own profile on the left side of the page in a similar style to the comic, with their picture on the left side of their name, their Twitter handle under their name (which explains the extra line of text under what is presumably the name) and their "bio" right below those. The Twitter "bio" is a

space usually used for the user to explain who they are. Common details about a person which are included in their “bio” are their profession, their personal interests and the products they have for sale. Some people also write about their personality, such as the one in the comic, which is quite outspoken and frank about her opinions.

The title of this comic is “Defensive Profile”. “Defensive” is the opposite of “offensive”, which is a word that might be used to describe the contents of profiles which display such a warning as in the comic. However, the feature reveals the warnings to actually be defenses against behaviors that deeply bother the profile owner. The profile is thus proved to actually be “defensive” instead of “offensive”, at least regarding the warning text.

#1912: Thermostat

November 06, 2017



Your problem is so terrible, I worry that, if I help you, I risk drawing the attention of whatever god of technology inflicted it on you.

Explanation

Hairy is working at a tech support office, and receives a call from Cueball. After the scripted greeting, Cueball, who has the most bizarre tech issues, tells Hairy that his thermostat – a single-purpose device used to control indoor heating and air conditioning – is showing an error screen from the Android operating system, and asking if he wants to partition the volume. Android is a fairly common operating system for small smart devices including thermostats, but the error implies that it is trying to mount a file with .doc extension (likely a Microsoft Word document) as the boot device. An added twist is the "(1)" in the filename, which is commonly appended when a user attempts to copy a file into a directory that already has a file with the same name. Furthermore, the extension .docx has been the default option from Microsoft Office 2007 onwards rather than the earlier .doc extension used in the comic, implying that the file is likely a rather old one.

The error message suggests a system problem at a low level of the device. Not only is the operating system missing, but the device is trying to locate the operating system inside a Microsoft Word document, something that has little to do with regulation of temperature and probably has no way of getting onto the device in the first place, let alone being considered as a bootable file.

This is so abnormal that Hairy is briefly struck silent and, upon recovering, he suggests Cueball walk into the sea,

rather than try to solve the issue.

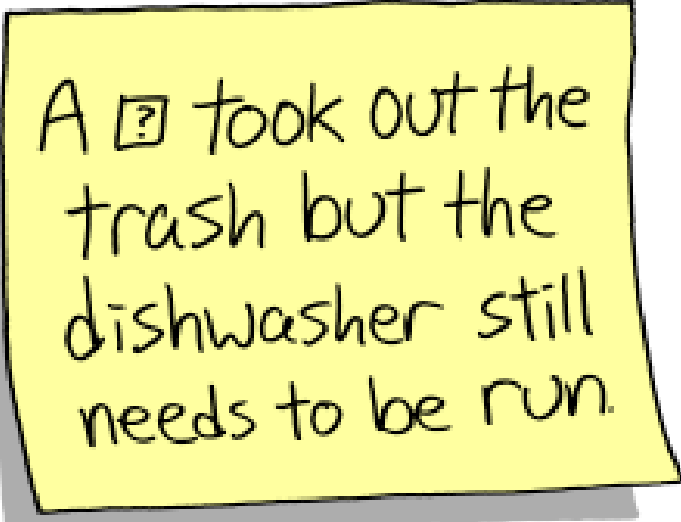
The title text elaborates that the situation is so absurd that it must be divine punishment, so Hairy does not want to try and help him for fear of invoking the wrath of whatever deity is issuing it.

Part of the humor is in the problem being only a slight exaggeration of real software issues. The symptoms are unlikely, yet possible (a thermostat could be running Android and could generate a report as a .doc file; given some data corruption, the name of the .doc file could get into the boot script and a volume could appear unpartitioned). It would take an expert Android or Unix engineer to fix, particularly on an embedded device with no obvious way to connect remotely or attach a keyboard. In real life, it would probably be easier to just replace an embedded device whose software was this broken.

This is explored further in 2083: Laptop Issues where throwing Cueball into the ocean is mentioned. Both comics could explain the original "computer problem link to oceans" comic 349: Success.

#1913: A 💎

November 08, 2017



A [?] took out the
trash but the
dishwasher still
needs to be run.

APPLE CAN TRY TO FIX THE AUTOCORRECT
BUG, BUT I'VE ALREADY INCORPORATED
IT INTO MY HANDWRITING.

If you want in on the fun, map a key on your keyboard to the sequence U+0041 U+0020 U+FFFD (or U+0021 U+0020 U+FFFD for the exclamation point version), and then no update can ever take this away from you.

Explanation

After the update to Apple's iOS 11.1, many (though not all) iPhone users suffered from a strange bug, where the autocorrection changed any input of the single lowercase letter "i" to either "A" or "!", followed by a space and a Unicode variation selector 16 (U+FE0F, on iOS displayed as a question mark in a square). The expected behavior is replacing "i" with a capital "I".[citation needed] Using a replacement character (U+FFFD) to approximate this display, the result of typing "i took" might be "A ❖ took" or "! ❖ took". In a handwritten text, the "❖" symbol could then be mistaken for a censored word, signifying indignation against the person taking out the trash. This problem previously manifested as an "I" followed directly by the VS-16 "emojify character", turning them into an "❖" without the "A".

The note in this comic is the equivalent of starting a text message with "i took out..." and triggering the iOS bug. The joke revolves around acceptance of the bug through repetition has influenced the writer's hand written style.

The codes in the title text refer to "A ❖" and "! ❖" respectively. The text provides a way to keep the "bug" active with the U+FFFD approximation, (which can be realized through the use of a Cydia tweak) even after it is patched. Although this would have no practical use, it is still a fun way[citation needed] for iPhone users to keep the infamous bug fresh in everyone's mind, and to make sure that the Apple company never lives down the

embarrassing incident.

The statement in the title text "no update can never take this away from you" is a double negative, which is a considered non-standard grammatical use in modern English, although common in many dialects. Taking literally it could actually mean "any update can take this away from you". This may be a typo or a colloquial use, with the intended meaning to be "ever" instead of "never" with some exaggeration.

#1914: Twitter Verification

November 10, 2017



When we started distributing special status tokens that signify which people are important enough to join an elite group, we never could have imagined we might be creating some problems down the line.

Explanation

At the time the comic was posted, some Twitter users (such as Randall Munroe, Coldplay, and Donald Trump) had a blue verification checkmark next to their name. This checkmark was used to indicate that the user is who they say they are, rather than being a fake account made by someone else using their picture and name. This helps fans find the real accounts of their favorite celebrities. However, since the most notable people benefit from this the most, there is some ambiguity in the granting of the verified mark, as it also seems to be interpreted as a status symbol to indicate the notable celebrities. Some even see this as Twitter actively endorsing the user. For this reason, Twitter has removed verified checkmarks from real accounts of celebrities because of political controversies in the past. Examples of this are political commentator Milo Yiannopoulos (before he was banned from the service). One recent controversial decision regarding the verified mark is that Twitter gave a verification checkmark to Jason Kessler, the organizer of a recent far-right rally in Charlottesville, Virginia. This drew attention to Twitter's verification system, so they temporarily suspended it.

The title text comments on the lack of foresight on Twitter's part when implementing the verified system: as it by design separates users between an in-group and an out-group, it seems to imply endorsement or, at least, favors some users to the detriment of others. This in turn automatically creates the twin sets of "people who

shouldn't have been verified, but were" and "people who deserve to have been verified, but weren't." As the internet is populated by various large and strongly opinionated groups [citation NOT needed], neither set will ever be empty and Twitter will always be seen as either endorsing unworthy or snubbing worthy people. There have been considerable problems created by this; see Twitter verification for more information.

The character depicted is the (at the time of publication) Twitter CEO Jack Dorsey, judging by the beard.

Since Elon Musk bought Twitter, the "legacy" checkmarks given according to the rules above have been removed, and the only checkmarks are blue ones for anyone who pays for a Twitter Blue subscription, as well as other ones for organizations and government officials.

#1915: Nightmare Email Feature

November 13, 2017

ENJOYED IT! I'M BUSY THIS WEEKEND,
BUT LET ME KNOW IF YOU'RE FREE
SOMETIME NEXT WEEK AND WANT TO
GET DINNER OR SOMETHING.

TOTAL TIME SPENT REVISING THIS EMAIL
BEFORE SENDING: 47 MINUTES 12 SECONDS



MY NIGHTMARE EMAIL FEATURE

"...just got back and didn't see your message until just now. Sorry! -- TIME THIS MESSAGE SAT HALF-FINISHED IN DRAFTS FOLDER: 3 days, 2 hours, 45 minutes."

Explanation

Most modern email clients provide tools to help their users read, write, and keep track of email efficiently. For instance, the user may receive a notification if the email body contains wording that suggests a file has been attached, but there is no actual attachment, in order to prevent them forgetting to include the intended file in the email.

This comic suggests a similar feature, one which would inform not the user, but the recipient of the message, how long the email has been revised before being sent. This is an expansion of a common feature of collaboration tools used by law firms, and modern word processors such as Microsoft Word 2016. Randall calls this his nightmare email feature, implying he spends too much time in revision of what should be simple email messages and that making himself - or worse, the recipient - aware of the actual time would make him anxious.

In the case shown it seems that the sender and recipient of the e-mail had recently met, and the recipient suggested meeting again this weekend. It then took 47 minutes to write a short reply in which the sender ends up saying only that they enjoyed the thing referred to, but, alas, they have no time this weekend, and then lets the other suggest a possible time for a dinner... or something. Of course there could be more to the email above the panel, but it seems to be a very short answer to

another e-mail, and it increases the nightmare for the writer (and the impact of the joke) if this was all that was written in 47 minutes.

If the text had been written out in less than 2 minutes, it would not have been a problem, but it seems the writer of this e-mail had to think a lot about how it was phrased. This could lead the recipient to wonder what took so long. Was it that they did not enjoy it, but ended up writing this to be nice? They only write that they are busy this weekend, thus not giving any reason as to why, and the last part allows them the possibility of also being "busy" on whatever time is suggested for dinner. Also, "or something" is very non-committal. Alternatively it could be the opposite, for a case where the writer enjoyed the time a lot, and is really looking forward to another meeting, but tries to seem relaxed and open minded, to not scare the other person away. All of this would also be true if it had been written in 2 minutes, but then at least there would have been the excuse of not having spent a lot of time thinking about how the reply was phrased.

The title text describes a similarly uncomfortable feature, which would inform the recipient how long a message has been sitting in the user's drafts folder, thus highlighting their procrastination, as well as demonstrating that "(...)didn't see your message until just now" is a lie, or at least it was only true when the original message was written, and now three days later another message should have been written instead. This feature would also be able to catch anyone who tries to avoid the feature depicted in the comic by saving the email in

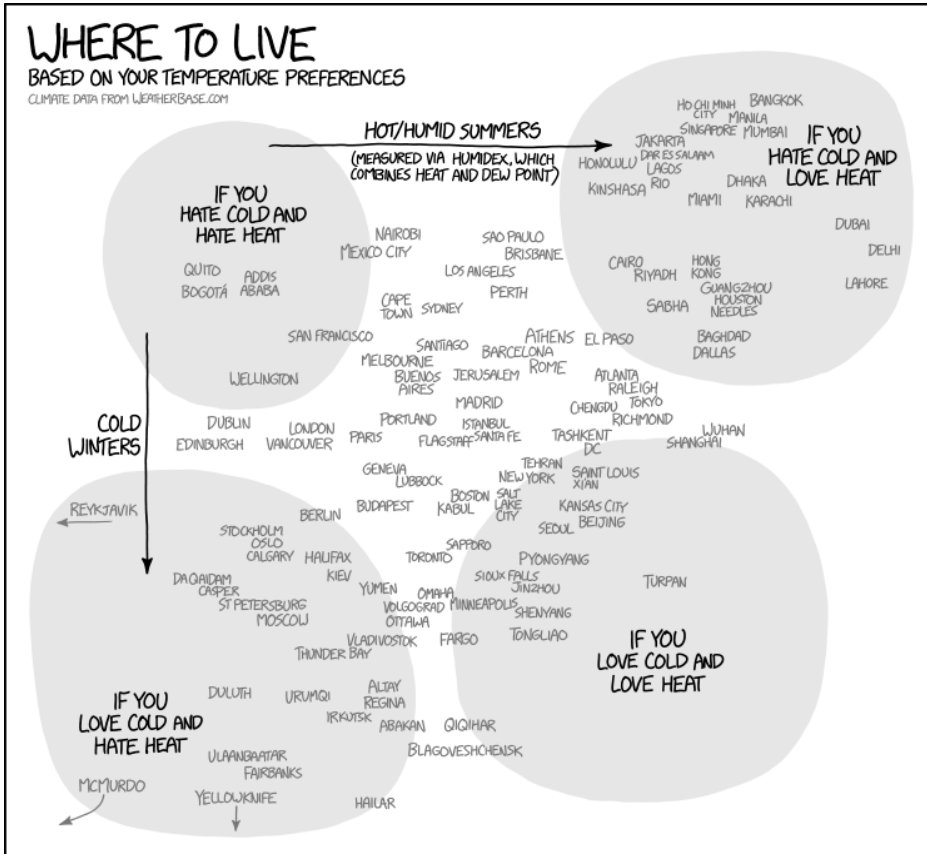
"drafts" while making revisions outside the mailing software, either mentally or in another word processing program.

Randall has explored a related anxiety-inducing feature of instant messaging in 1886: Typing Notifications.

Applying the feature in the comic to this explanation: it sat incomplete in this wiki for approximately 2 months and 26 days (since the comic's creation), before an unregistered user removed its incomplete tag.

#1916: Temperature Preferences

November 15, 2017



There's a supposed Mark Twain quote, "The coldest winter I ever spent was a summer in San Francisco." It isn't really by Mark Twain, but I don't know who said it—I just know they've never been to McMurdo Station.

Explanation

This is a chart of major (and not-so-major) populated areas showing seasonal temperature patterns. The chart is a guide to where one might like to live depending on how much summer heat and winter cold they enjoy. There are four focused zones:

- Hate both cold and heat -- Neither summers nor winters are too extreme. These are either places at high altitude in the tropics (e.g. Quito, Addis Ababa) or areas at mid latitudes in Mediterranean climates (e.g. San Francisco, Wellington). All of these areas (as well as cities near this zone such as Mexico City and Melbourne) have a climate type of C-b in the Koppen Climate Classification, indicating a temperate climate with a warm summer.
- Hate cold but love heat -- Very hot in the summer. These are all either tropical regions with a latitude of 23°26' or less (e.g. Rio, Bangkok, Manila) or desert areas very near the tropics (e.g. Needles, Baghdad). These areas all have a climate type of A-, indicating a tropical rainforest, savanna, or monsoon climate; or a classification of B-h, indicating a hot desert or arid climate. All cities listed with a Af/Am/Aw climate type fall in this zone.
- Hate heat but love cold -- Very cold in the winter. These are typically places at high latitudes (e.g. Moscow, Oslo), with almost none of the places listed below 40°, and the average latitude being 51°. These

areas tend to have a climate type of B-k, indicating a cold desert or steppe, or D-b, indicating a continental climate with a warm summer. Some of the coldest places, including those off of the chart, have a climate of Dfc subarctic (e.g. Fairbanks and Yellowknife) or EF ice cap (McMurdo).

- Love both heat and cold -- Both summers and winters are extreme. These places are either in the inland of North America (e.g. Sioux Falls, Kansas City) where there is no nearby ocean to buffer temperatures; or, interestingly, clustered around the Yellow Sea (e.g. Seoul, Beijing). These places are almost all climate type D-a, indicating a continental climate with a hot summer. Turpan, the place farthest toward the love heat/love cold corner, has a climate so miserable that it meets the requirements for both climate type BWk (cold desert) and BWh (hot desert) at the same time.

The summer heat axis is determined by humidex, a system that combines heat and humidity to generate an estimate of perceived "summer discomfort".

Note that if the values from this table are charted, the result is similar but not exact to how Randall drew the comic. For instance, he shows Kinshasa as having a "colder" winter than Honolulu, but the average low in the coldest month for Kinshasa (20°C) is hotter than the average low in Honolulu (18.9°C). In general these differences are minor, but a few stand out:

- Lubbock is shown having a climate similar to Geneva or Budapest, but in reality it should be in the "Love Cold

and Love Heat” zone. The coldness of the winter is accurately reflected, but the hottest month Humidex is similar to Xi’an or Saint Louis.

- Casper is shown in the “Love Cold and Hate Heat” zone, but its summers are much warmer than shown. It should be closer to Toronto, both have a peak month Humidex of around 30-31°C.
- Omaha should be in the “Love Cold and Love Heat” zone. Its hottest month Humidex of 37.2 is warmer than Jinzou, which has a similar coldest month.
- Los Angeles should be in the “Hate Cold and Hate Heat” zone. Its hottest month Humidex is only 26.7, which is less than Mexico City or Nairobi.
- Flagstaff and Santa Fe are shown as having warmer winters than they do. They should be grouped with Boston, Kabul and Sapporo (average coldest month low of -5°C to -8°C) rather than Istanbul, Madrid and Portland (average coldest month low of 1°C to 2°C)

It is not certain if these differences are a due to errors, the use of a different data set, or deliberate “Easter Eggs” set to see if anyone would notice.

According to Randall:

- People who love cold should live where the average low in the coldest month is -3°C or less.
- People who love heat should live where the hottest month Humidex is at least 33°C (in otherwise cold places such as Minneapolis) to 38°C (in otherwise hot

places such as Honolulu).

- People who hate cold should live where the average low in the coldest month is higher than 3°C .
- People who hate heat should live where the hottest month Humidex is less than 29°C .

However, given the great variability of weather patterns across the globe, it's not altogether clear how useful this would actually be to someone looking to choose where to live, since it's not clear exactly what "love/hate hot/cold" would mean. It's also not clear that the relationship between temperature and discomfort is linear. More likely is that there is a small temperature band where each degree of change causes significantly more discomfort, and beyond which it's just "too hot/cold".

Hottest and coldest month therefore may not be the best measure. For example, is one or two very cold days better or worse than a month's worth of moderately cold days? Shown in the table below for each place are the number of days above 32°C (90°F) and the number of days below 0°C (32°F), taken from Weatherbase.com (Randall's source). For most people a temperature above 32°C is considered hot and a temperature below 0°C is considered cold. So, for instance, someone who loves heat might want to live in Tehran (with three months above 32°C) rather than Beijing (with only one month) even though the peak month Humidex in Beijing is higher. Someone who loves cold might want to live in Santa Fe, where it never gets particularly cold (only -8°C) but where it is below freezing almost half of the year

(179.8 days on average). In general though, the places with the most hot or cold days also have the hottest and coldest extremes.

Once again, Turpan stands out for its misery, with days above 32°C totaling four months and days below 0°C totaling four months. In fact, on average there is at least one day every month of the year that the temperature is either above 32°C or below 0°C. This includes almost every day in June, July and August being hot and every single day in December, January and February being below freezing.

Some of the most extreme climates on earth are not shown on this comic, however, perhaps because some of them are uninhabited. Eismitte (a camp established in the center of Greenland in the 1930s) and Vostok Station (in the center of Antarctica) both see temperatures far colder than McMurdo, although being in the middle of ice caps neither can be inhabited without outside support. The areas around Oymyakon and Verkhoyansk in eastern Siberia also see temperatures colder than McMurdo and are actual towns, although summer temperatures are much higher. In both places the summer weather is generally average (Humidex of 22°C to 23°C) but they have seen record highs of 34°C to 37°C and record lows of almost -68°C, giving them the greatest temperature swings on earth. Bouvet Island is a small island in the South Atlantic Ocean, near the latitude where there are no land masses to interrupt storms and currents (south of South America but north of Antarctica). As a result it has one of the most

consistent climates on earth, with a high and low almost always within a few degrees of 0°C all year long – a perpetual state of almost to just freezing, combined with clouds, fog, wind and rain from ocean storms. Death Valley in California, Shahdad in Iran, and Murzuk in Libya all vie for having the highest temperature in the world, although not the highest Humidex.

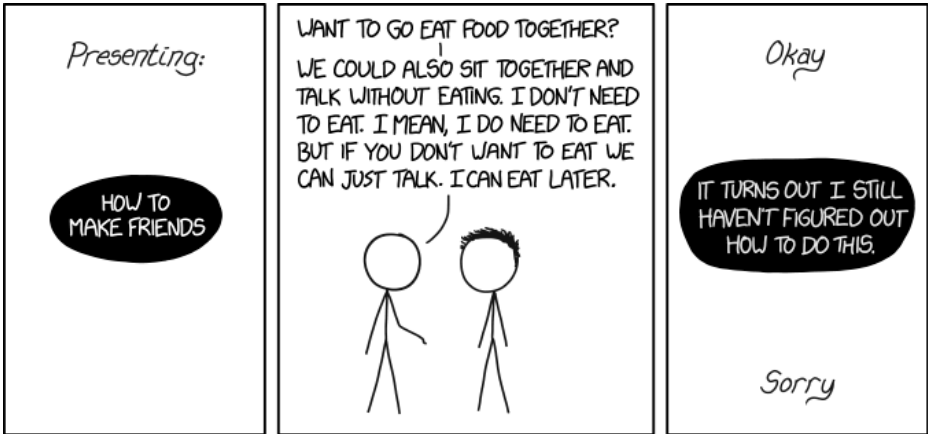
The relevant temperature data for these extreme locations, where known, is in the second table for comparison.

The title text refers to a quote sometimes attributed to Mark Twain; however, as it points out, the quote is misattributed, and it is unknown who created it. The text then goes on to claim that the person who originally said the quote never visited McMurdo Station, a US Antarctic research center, which is certainly a colder place than San Francisco.

Istanbul spans both Europe and Asia but its city center is located in Europe.

#1917: How to Make Friends

November 17, 2017



No, wait, come back! I want to be friends at you!

Explanation

This comic follows a sample interaction, purportedly showing how to make friends. We see Cueball's strategy for making friends. It does incorporate various points of advice for building friendships, which are completely sound in the abstract. But it's clearly not helping him -- he's out of sync with the interaction context and makes bigger social gaffes by following the abstract advice. Escalating awkwardness ensues.

It starts out with a common way of making friends or interacting with friends, hanging out over a meal. However, Cueball suggests doing so with awkwardly literal phrasing; whereas most people use expressions such as “have lunch” or “grab a bite to eat”, Cueball explicitly invites Hairy to “eat food”. The fact that he feels the need to clarify that they’ll be eating food, as opposed to any other orally consumable items, indicates his lack of confidence to clearly communicate his intentions.

Before Hairy can even respond, Cueball then says that they could instead “sit together and talk without eating.” Although this is indeed another common way to make friends, it’s kind of an odd way to phrase it, especially since he didn’t even give Hairy a chance to reply to his initial suggestion. Cueball then says he doesn’t need to eat (meaning not right now, especially as a prerequisite to talking), but he immediately feels compelled to clarify that he does need to eat (meaning in general). Again, it’s

weird that he clarified, as his original wording probably would have been understood. He then awkwardly remarks about how he can eat later if Hairy would rather just talk. The overall implication is that Cueball's awkwardness and over-explanation would put off a typical person, although some people find it endearing.

This is a situation that Randall has encountered before, in 1746: Making Friends, in which he offered "advice" to play dead to attract new friends and/or turkey vultures; presumably he has "learned" from his unsuccessful attempts and is trying more conversational approaches, but apologizes to the reader as he hasn't quite figured that out either.

The title text says Cueball wants to be friends at Hairy, rather than with him, which isn't how friendship usually works. "At" implies that Cueball considers being friends to be a unilateral action that he needs to direct towards Hairy, like "smiling at" or "pointing at", and does not understand that it is typically a mutual activity of building a relationship, which would be indicated by being friends with him. "At" can even carry a degree of animosity (compare: "he just phoned up to wash his head at us").

#1918: NEXUS

November 20, 2017



You also refuse to buy Cisco products because you hate the Thong Song, O. Henry, Deep Space Nine, freshwater whitefish, teenaged Incan emperors, Brak's brother, and vegetable-based shortening.

Explanation

Cueball is confusing NEXUS, a USA and Canada border control pre-screening program, with Hexxus, the villains from the animated film FernGully.

Trusted traveller programs like Nexus allow people who match certain criteria to apply for a membership and subsequently save time when boarding airplanes or crossing borders via use of expedited lanes.

FernGully is a story set in an Australian rainforest inhabited by fairies including Crysta, who accidentally shrinks a young logger named Zak to the size of a fairy. Together, they rally the fairies and the animals of the rainforest to protect their home from the loggers and a malevolent pollution entity, Hexxus. Hexxus has previously been mentioned in 1750: Life Goals as an especially hard-to-spell word and in 1767: US State Names (as a replacement for Texas).

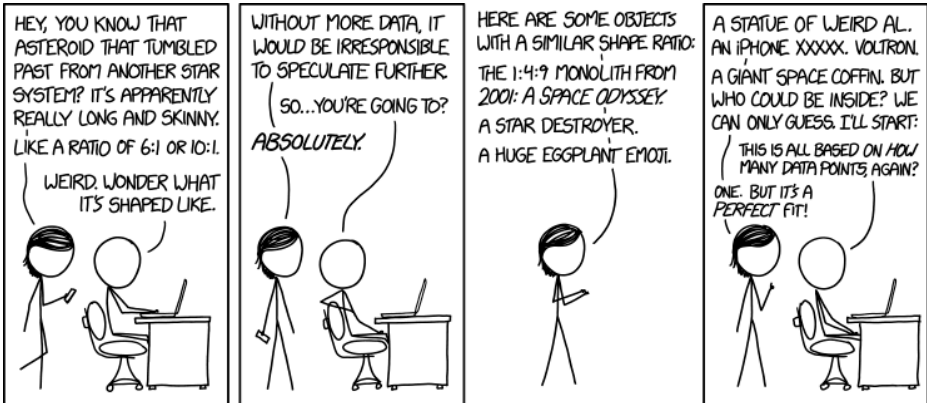
The title text is confusing Cisco (a telecoms & tech brand which has a line of switches called Nexus) with:

- The artist Sisqó who performed 'Thong Song'
- The Cisco Kid, a character created by O. Henry in the short story "The Caballero's Way"
- Benjamin Sisko, commander of a space station in the Star Trek Universe (Deep Space Nine)
- Ciscos (freshwater whitefish)

- Kuzco, teenaged Incan emperor in The Emperor's New Groove
- Sisto, brother of Brak in The Brak Show
- Crisco (vegetable-based shortening)

#1919: Interstellar Asteroid

November 22, 2017



Every time we detect an asteroid from outside the Solar System, we should immediately launch a mission to fling one of our asteroids back in the direction it came from.

Explanation

‘Oumuamua is the first detection of an interstellar asteroid passing through the Solar System originating from another solar system.

Megan’s list of objects with a similar shape ratio:

- The 1:4:9 monolith from the sci-fi movie 2001: A Space Odyssey.
- A Star Destroyer, a spaceship in the Star Wars universe. This one seems particularly unlikely, as the Star Wars mythos is set a long time ago in a galaxy far, far away, and rarely (if ever, depending on the continuity) strays outside of said galaxy.
- Huge eggplant emoji (, U+1F346 Aubergine, commonly used to represent a penis).
- Statue of "Weird Al" Yankovic, an American singer and parodist.
- iPhone XXXXX, likely making fun of Apple’s iPhone X and larger in size. Multiple X’s generally have a sexual connotation (see 1571: Car Model Names).
- Voltron, a giant robot from the animated series Voltron: Defender of the Universe.
- A giant space coffin with someone inside.

As soon as Megan lists off the last item, she is about to start speculating within her own speculative scenario about who or what might be in the coffin before Cueball

interrupts her. Cueball attempts to bring Megan back down to earth by reminding her that she has too little data to work with (one data point), but Megan is far too excitable to listen to reason. A good example of the dangers of speculating irresponsibly, it would seem.

It could also be argued that Megan with this makes fun of many news outlets whose first reaction to a new space body often seems to be to search for something to compare its shape to, such as with the 'rubber duck' comet. Making fun of media covering science news is a recurring theme on xkcd.

The title text suggests taking reciprocal action by sending asteroids away when the solar system receives them. This would, of course, be difficult, given the amount of energy needed to shift asteroids outside of the Sun's gravity hold. On top of that, it appears to imply that some non-human entity is sending these rocks, which is an inane idea. This could be a reference to the movie *Starship Troopers*, where a race of aliens mankind is at war with supposedly hit Earth with asteroids. Given that a typical interstellar traveler -- like the one spotted now in real life -- spends millions of years getting from one star system to another, the movie's idea is plain stupid; in fact, the movie gives no proof the aliens were actually responsible, leading to a common fan theory that the asteroid was indeed random space junk and the aliens are being framed by the human government as pretense for war.

#1920: Emoji Sports

November 24, 2017

NEW SPORTS CREATED FROM RANDOM EMOJI

	LAVABALL		HEDGEHOG CURLING
	BLADEBALL		BURGER CLAMPING
	FANCYBALL		CONSEQUENCE ARCHERY
	HORSE HOLE		OWLSTUFFING
	BASKETBALL SHREDDING		CANDLE EATING
	EGGSPOTTING		CONSEQUENCE GOLF
	ALLIGATOR JUMPING		SNAKE SHAMING
	MERFISHING		HELL ESCAPE
	TINKERBALL		MULTIPLAYER AVOCADO

No horse has yet managed the elusive Quadruple Crown-winning the Kentucky Derby, the Preakness, the Belmont Stakes, and the Missouri Horse Hole.

Explanation

This comic, as the heading indicates, arbitrarily selects emoji and uses them to make up very bizarre sports. Although some of these might be completely normal, most of them take things to a completely absurd level.

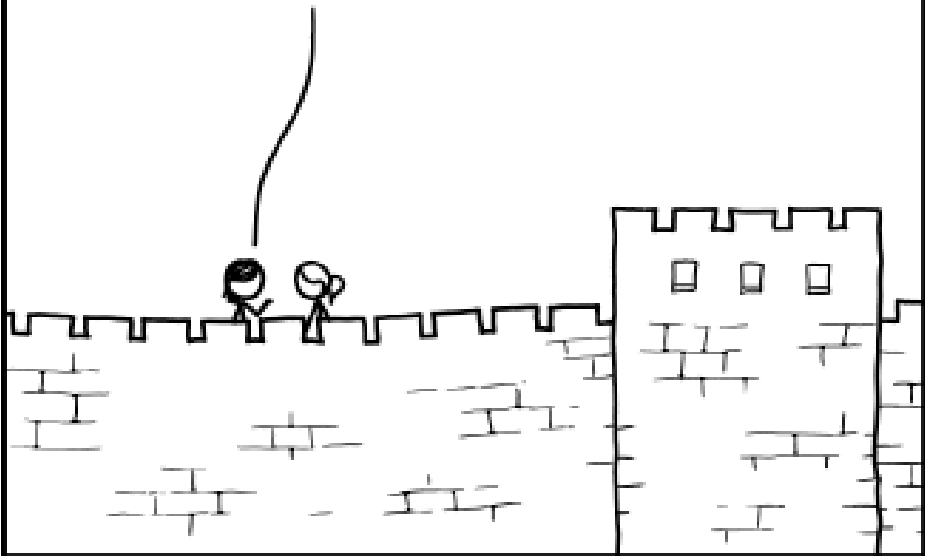
The title text is a reference to the Triple Crown, which is an highly prestigious award given to a three-year-old thoroughbred horse who wins the Kentucky Derby, the Preakness Stakes, and the Belmont Stakes, the first three of the four listed events. The joke is that if Horse Hole was a real sport, then one who won a major competition for it, the Missouri Horse Hole, in addition to the three main horse racing events, would win a "Quadruple Crown".

Please note that some emoji may not be supported by your browser, in which the emoji will appear as a black rectangle, and if there is a male/female version of the emoji, a male/female sign will appear next to the rectangle.

#1921: The Moon and the Great Wall

November 27, 2017

DID YOU KNOW THAT THE MOON'S CRATERS
AND PLAINS ARE THE ONLY STRUCTURES
ON THE SURFACE OF A CELESTIAL BODY
THAT CAN BE SEEN WITH THE NAKED EYE
FROM THE GREAT WALL OF CHINA?



And arguably sunspots, on rare occasions. But even if they count, it takes ideal conditions and you might hurt your eyes.

Explanation

This is a reference to the myth that the Great Wall of China is the only man-made object that can be seen from the Moon (or from space) with the naked eye. Sadly, it cannot. In fact, it's barely visible from the orbit of low satellites. Not only that, even if it was visible from space, it wouldn't be alone with that title. There are plenty of objects visible from space, the Chernobyl Nuclear Power Plant is able to be seen from space, so are the clusters of greenhouses in Almería Spain.

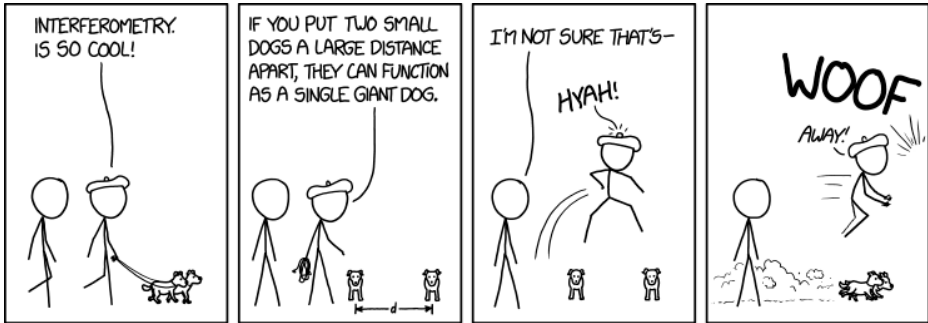
This comic mocks the myth by conflating it with another saying about the Moon, and how the Moon's craters and valleys are visible to the naked human eye. Indeed, the Moon is the only celestial body for which this is true, as all other bodies (with the potential exception of the Sun, see the title text) can only be seen as tiny points of light by the unaided human eye. There is nothing special about the Great Wall of China in this factoid, though; the Moon's features can be seen equally well from practically any place on Earth with a view of the Moon.[citation needed]

The title text states that one is sometimes able to see large sunspots if any are present and conditions are ideal. However, looking directly at the sun with the naked eye risks extensive damage to the eye and should NEVER be done. It could, however, be possible to see them when the Sun is seen through a thin cloud cover or maybe at sunset/sunrise. (It's possible to see very large sunspots

with solar eclipse glasses or other adequate protection,
but that's not unaided human eye.)

#1922: Interferometry

November 29, 2017



It's important to note that while the effective size of the dog can be arbitrarily large, it's not any more of a good dog than the two original dogs.

Explanation

Interferometry is the practice of overlapping two different waves to get a different signal, which can be used to determine the distance between two reflecting surfaces. An astronomical interferometer uses this principle to build an array of separate telescopes that are able to work together as a single telescope, effectively providing higher resolution using a process known as aperture synthesis.

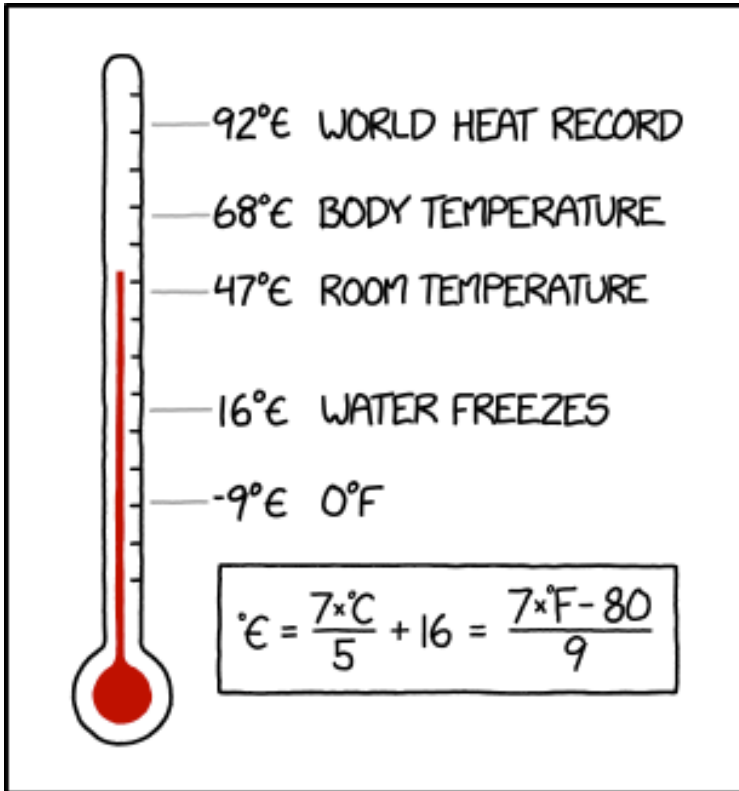
In the comic, Beret Guy and Cueball are walking Beret Guy's dogs when Beret Guy makes a comment on how interferometry is really cool. Beret Guy states that two dogs placed at a consistent interval will function as a larger dog — a play on the astronomical interferometer. While this idea works on waves, it probably won't work on dogs[citation needed] (though since $h/p=\lambda$ it might), which is why Cueball is confused and starts to correct him. Before he can respond, however, Beret Guy jumps on his "large" dog and appears to be floating in midair. The existence of a large dog is further proven when it gives out a large bark. Cueball looks on speechless while Beret Guy appears to exhibit another of his strange powers: he perceives reality in a certain way and reality alters itself to how he perceives it.

In 1614: Kites, Beret Guy is "walking" a dog. It is possible that one of the dogs in this comic is the dog from that comic.

The title text states that the effective giant dog is not any more 'good' than the two original dogs. This is analogous to sensitivity for astronomical interferometers. Interferometry does not increase the light-gathering area, so it cannot view dim objects as well as a single large telescope could. This is also a reference generally to dog-owners calling their dogs "good dog" or "good boy/girl" when they behave well; presumably, Beret Guy's giant interferometry dog is only as well-behaved as the dogs they are derived from. (However, as interferometry does collect more light than any individual telescope used, the interferometry dog is presumably more good than either individual dog. Considering the destructive potential of a giant bad dog, this is a good thing.) It may also be a reference to the 'They're Good Dogs, Brent' meme.

#1923: Felsius

December 01, 2017



SINCE THE CELSIUS VS FAHRENHEIT DEBATE
HAS PROVEN SURPRISINGLY HARD TO RESOLVE,
AS A COMPROMISE I'VE STARTED USING
FELSIUS (°€), THE AVERAGE OF THE TWO.

The symbol for degrees Felsius is an average of the Euro symbol (€) and the Greek lunate epsilon (€).

Explanation

Just like in 1292: Pi vs. Tau, Randall tries to unify two measurement systems by averaging both values. There are several temperature scales actively used in different parts of the world for different purposes, including Celsius and Fahrenheit, but e.g. also Kelvin, Rankine and potentially several others.

The United States customary units system uses Fahrenheit, as does the closely related one of imperial units. Alternatively, metric units use Celsius or Kelvin. While Fahrenheit is still used in the US, its territories, the Bahamas, Belize, the Cayman Islands, Liberia and Palau, all other countries use (or prefer) Celsius. In scientific work, including in the US, only Celsius and Kelvin scales are used.[actual citation needed]

The conversion factors between Celsius and Fahrenheit are:

which makes the average (mean) value of °C and °F: $^{\circ} = ^{\circ}\text{C} \times 7 / 5 + 16$. The step-by-step derivation of this is:

Randall chose to name his new unit of temperature Felsius (a portmanteau of Fahrenheit and Celsius).

Comically enough, the Felsius scale discards the main advantages of either temperature scale. The Celsius scale is based around 0 °C as the melting point of water and 100 °C as the boiling point, which is an advantage Felsius does not preserve. Fahrenheit is often argued to be a

convenient temperature measure for human comfort, as 0 °F is very cold and 100 °F is very hot and many places on Earth which humans inhabit fall handily within these extremes the majority of the time, but Felsius does not preserve this advantage of the Fahrenheit scale either.

The title text states that the symbol he chose to represent this unit also is the average of two other symbols. Visually, it is assumed to be a combination of Celsius and Fahrenheit (a C with a crossbar), but it is actually like one or other of the unrelated symbols for the euro currency (€) and the Greek lunate epsilon (ϵ). Randall's symbol has a single crossbar, like the Greek lunate epsilon, but the crossbar continues to the left, like the Euro symbol. (In this explanation and the transcript, we have used the mathematical symbol $U+22F2$, which may appear too large or too small depending on the font.)

In doing all this, Randall has fallen into the trap of creating a new temperature scale/standard.

Randall has also compared Celsius and Fahrenheit scales earlier in 1643: Degrees, and in 526: Converting to Metric he tries to give users of the Fahrenheit scale an idea about what a given Celsius temperature would feel like. Later on he will rate the "cursedness" of various scales, respectively as 2/10 and 3/10, but we do not discover his opinion of his own combined scale.

This is an example of Argument to moderation, also known as the false middle point fallacy. A famous use of this fallacy is in the Bible, the Judgment of Solomon.

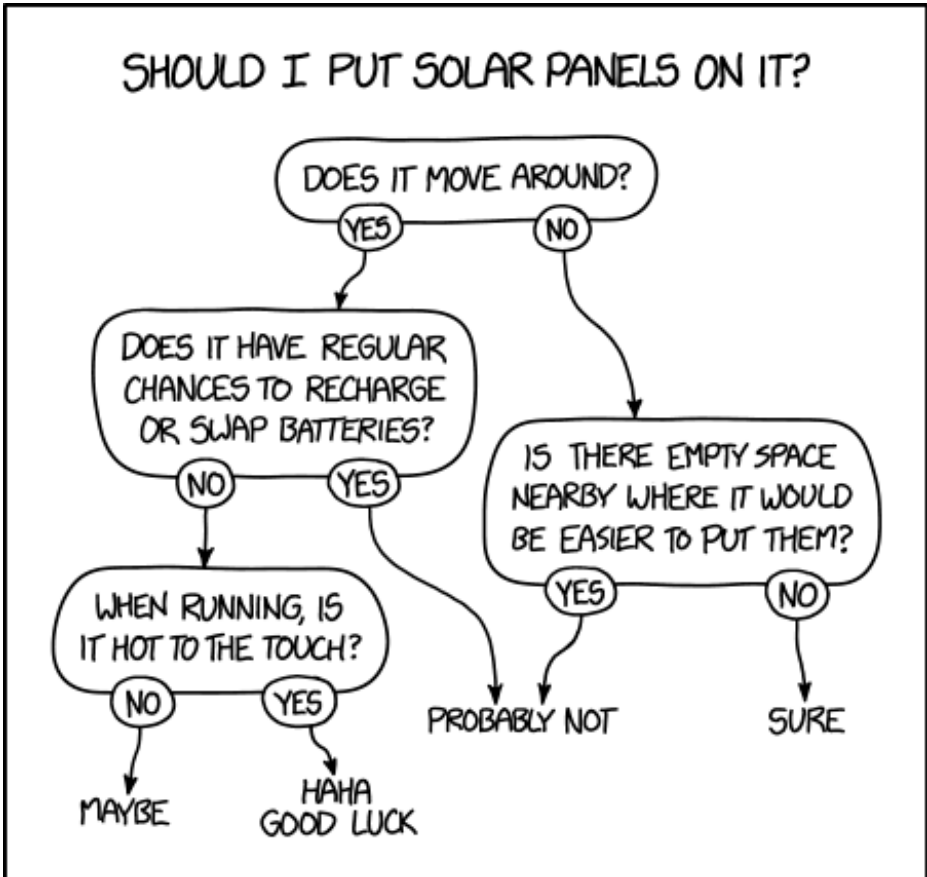
The true mother of a disputed baby is discovered by proposing the "compromise" of cutting the baby in half. Perhaps Randall has a similar strategy in proposing Felsius, an absurd compromise, in order to somehow discover the "true" temperature scale.

Note that this is not the first (or last) time Randall has proposed a controversial 'third' way.

Table of Given Conversions & Additional[edit]

#1924: Solar Panels

December 04, 2017



This works for a surprising range of sunlit things, including rooftops (sure), highway surfaces (probably not), sailboats (maybe), and jets, cars, and wild deer (haha good luck).

Explanation

This handy decision tree aims to help in finding out whether a given object should have solar panels installed on it.

The root question is whether the object of choice moves. If it doesn't and has no nearby empty space that would be more practical for the solar panel installation, then yes, the object should be equipped with the solar panels. If the object is static, but you could more easily install the panels somewhere else nearby, probably that's the best place. An example of this is a slanted rooftop of a house or a field on a hillside: it's certainly possible to put solar panels there, but if a flat surface, like a flat-roofed house or a level field, is available, it would generally be easier to put them on that. This way, you can select the optimal direction for the panels to face, which might not be possible on a given incline, or even have them move to track the sun. However, if the house has a side that is turned towards the sun (south in the Northern hemisphere) then a house roof could be even better than on the ground, which is why the title text says "sure" for rooftops. For another example of things where "putting next to it" instead of "on it" is generally the easier (and arguably better) option, see the "highway surfaces" of the title text.

If the object moves, the next question is whether its batteries can be recharged or swapped with ease, in which case batteries may be a better option than solar panels, if

the purpose of the panels is to power the object. The idea is that solar panels on a vehicle sound like an interesting idea, but batteries can be much more easily (and economically) recharged from a fixed electrical station than using solar panels on the vehicle as a power source. It may be possible to have solar panels on the electrical station, but that is a separate device to consult the table on.

Finally, if the object moves and batteries are not an option, the last question is whether the object heats up during operation. If so, solar panels may not work well. Randall doubts it mockingly, see also the title text regarding his Haha Good luck final option.

Solar panels can only produce electrical power equal to about 20% of the solar radiation they receive. Thus, a device that heats up during use likely consumes much more power than the amount which could be produced by solar panels covering its surface - so "good luck". Obviously, many animals are also "moving objects" fitting this condition, and installing solar panels on them is bound to be a challenge.

Moreover, solar panels do not work effectively when excessively hot (solar panels are typically designed to operate in temperature ranges of 15-25 Celsius, 59-77 Fahrenheit, 288.15-298.15 Kelvin, 518.67-536.67 Rankine, 12-20 Réaumur, 15.38-20.63 Rømer, 127.5-112.5 Delisle, 4.95-8.25 Newton, $5.968\ 546 \times 10^{-21}$ - $6.174\ 608 \times 10^{-21}$ joules of translational kinetic energy or 37-51 Felsius).

But if changing batteries is not an option, and heat production and power requirements are low, then solar panels can be an excellent solution on a moving object. An excellent case for this is on space probes and satellites, which are typically powered entirely by solar panels (and reliably receive sunlight, because there are no clouds to interfere). Randall is well aware of this, as shown with the comics 695: Spirit and 1504: Opportunity about the two solar-powered Mars rovers, although in this comic he seems to have only been concerned with Earthbound objects.

The flow chart, however, does not mention if the thing in question actually needs solar panels, but according to the title text it works very well, and thus Randall implies that if the answer is sure then it is relevant to put solar panels there. The more solar panels in place, the fewer fossil fuels are needed, and this is in line with Randall's general interest in reducing climate change.

The title text suggests that this flow chart is very broadly applicable to anything the Sun hits.

Rooftops are classed as "sure", and those are, indeed, an active subject of solar installation (though, if there's suitable land nearby, it might not be the most efficient).

Highway surfaces are classed as "probably not". There have been proposals and experiments a concerning photovoltaic pavement covering roadways with solar panels, but these have proven to be impractically expensive and prone to damage. The flow chart suggests

that, since many highways are near land that could be used for solar panels, that will usually be the more viable option.

Sailboats are classed as "maybe". Unlike boats with motors, sailboats don't consume enough power to heat up, only requiring enough power to provide electricity for whatever equipment and appliances are on board. Since some sailboats are at sea long enough that swapping or recharging batteries may be difficult, solar panels could be a viable option.

Multiple other moving objects, including jets, cars, and wild deer ends up on the haha good luck result. While these examples seem unrelated, they all have the same limitation: they consume far more power while moving than could realistically be harnessed from solar panels (as demonstrated by the fact that they noticeably heat up). There are some experimental solar-powered cars, but these tend to be exceptionally low power (and resultingly low-performance) vehicles. Wild deer are clearly a humorous option, as they'd have little use for the electricity from solar panels, and would likely resist any efforts to install them. Nonetheless, Randall includes them to make the point that the chart is effective, even with ridiculous examples.

#1925: Self-Driving Car Milestones

December 06, 2017

UPCOMING AND RECENTLY-ACHIEVED SELF-DRIVING CAR MILESTONES

- AUTOMATIC EMERGENCY BRAKING
- HIGHWAY LANE-KEEPING
- SELF-PARKING
- FULL HIGHWAY AUTONOMY
- FIRST SEX IN A SELF-DRIVING CAR
- FULL TRIPS WITH NO INPUT FROM DRIVER
- FULL TRIPS BY EMPTY CARS
- SELF-REFUELING OF EMPTY CARS
- AN EMPTY CAR WANDERING THE HIGHWAYS FOR MONTHS OR YEARS UNTIL SOMEONE NOTICES THE CREDIT CARD FUEL CHARGES
- CARS THAT READ OTHER CARS' BUMPER STICKERS BEFORE DECIDING WHETHER TO CUT THEM OFF
- AUTONOMOUS ENGINE REVVING AT RED LIGHTS
- SELF-LOATHING CARS
- AUTONOMOUS CANYON JUMPING
- CARS CAPABLE OF ARGUING ABOUT THE TROLLEY PROBLEM ON FACEBOOK

I'm working on a car capable of evaluating arbitrarily complex boolean expressions on "honk if [...]" bumper stickers and responding accordingly.

Explanation

With the creation of self-driving cars, many new milestones are being found and/or solved thanks to them. Some are good, and some are downright weird. This comic lists some that have already been achieved, some that are being worked on and some that are facetious "milestones".

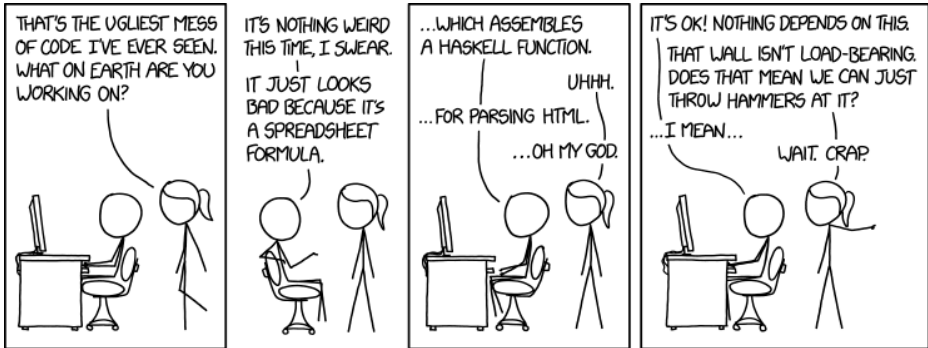
Milestones that have been fully or partially achieved[\[edit\]](#)

Milestones not yet reached[\[edit\]](#)

Facetious milestones[\[edit\]](#)

#1926: Bad Code

December 08, 2017



"Oh my God, why did you scotch-tape a bunch of hammers together?" "It's ok! Nothing depends on this wall being destroyed efficiently."

Explanation

This comic is the fourth in the Code Quality series:

- 1513: Code Quality
- 1695: Code Quality 2
- 1833: Code Quality 3
- 1926: Bad Code
- 2138: Wanna See the Code?

Ponytail has caught Cueball in the act of writing some messy code — code in the form of a spreadsheet formula, which in turn produces another program in a language called Haskell. Haskell is a purely functional programming language, a concept that has a debatably steep learning curve, which causes it to be somewhat obscure, as referenced in 1312: Haskell. It is explained that this code will, in turn, interpret more source code, specifically code written in HTML. Parsing HTML is notoriously tricky without a dedicated software library for several reasons, including frequent changes to web pages, a nested structure of tags and quotes that frustrates regular expressions, allowing new lines to be started almost anywhere, and different standards that are followed or not followed to varying degrees.

After Cueball excuses his bad code by stating that "nothing depends on this" (meaning that no other projects rely on this code being good to operate properly), Ponytail uses the analogy of breaking a

non-load-bearing wall to ridicule Cueball's excuse. A load-bearing wall is a wall that plays a role in supporting the building. Damaging such a wall would threaten the structural integrity of the entire building, and could potentially cause a collapse. In contrast, walls that aren't load-bearing are designed only to separate spaces within the building, and do not contribute to keeping the building up. Damaging or destroying such walls wouldn't endanger the overall structure of the building. However, supporting the building is just one of the functions which could depend on having an intact wall, and non-load-bearing walls are still there for a purpose. Walls serve many other important purposes, from creating opaque and sound blocking barriers (desirable for privacy purposes, particularly for bedrooms and bathrooms), to containing and protecting water pipes and electrical wiring. Ponytail's analogy suggests that, even though poorly written-code wouldn't cause the entire program to fail, it's still not a good idea.

Immediately after, Ponytail appears to have realized that she's only inspired Cueball to go ahead and break the wall, instead of swaying him away from writing ugly code. If left unchecked, this will only end in tragedy.

This is most likely a continuation of the Code Quality series, but it differs slightly. For one thing, all of the previous strips were named "Code Quality <number>", with the exception of the first, which was just named "Code Quality". Also note that, unlike the previous Code Quality strips, Ponytail does not start using similes like "This is like being in a house built by a child using

nothing but a hatchet and a picture of a house". It's also the longest explanation of Cueball's code by Cueball himself.

The title text suggests that Cueball's approach to breaking the wall - scotch-taping a bunch of hammers together - is as good as his code, and his excuse is similar.

#1927: Tinder

December 11, 2017



People keep telling me to use the radio but I really hate making voice calls.

Explanation

Tinder is a social media/dating app. The main interface of Tinder shows photos of people. Users swipe right for matches that they like, and left otherwise. The purpose of the app is to get dates, with the intent of a romantic relationship or sexual intercourse. However, in the comic, Cueball is trying to use it to primarily attract someone capable of flying a plane instead. If the request is genuine (and not just a foible), this is a bad situation, because it suggests Cueball is in charge of a plane that he is unable to fly, and unless he finds a match with someone who can (and is able to provide assistance) the plane will crash. Even then, unless the matched person happens to be on board, and therefore able to assist directly, providing help through Tinder messages is unlikely to be a sufficiently efficient way of solving the problem.[citation needed]

Alternatively, Cueball may simply be pretending that there is an emergency so that he can get matches on Tinder. In either case, depending on the jurisdiction, Cueball may be violating the law by using a cell phone that is not in "airplane mode" (in some phones, "flight mode" or "offline mode") when on an airplane. WiFi can be enabled on some flights during the entire flight; in others it may be banned during takeoff and landing. Even if he is either uploading the picture after the flight or using the in-flight internet service, he is still violating other, more serious laws (if he is a pilot, he may be liable for negligence, and if he is an ordinary passenger, God

knows what he may have done...)

The title text explains that Cueball's unwise method for getting help stems from astonishingly skewed priorities and no small amount of selfishness. He claims to strongly dislike conversing over audio-only channels, and this dislike is apparently so overwhelming that he would rather jeopardize his life and that of any passengers on the plane, than put aside his own hang-ups. Even if we give Cueball the benefit of the doubt and assume that he has a phobia of public speaking, most human beings tend to automatically suspend their irrational anxieties when experiencing the fear of imminent mortal peril, at least until after the danger has passed. For example, those normally afraid of dating Cueball would "match" with him to prevent a plane crash, which may be his secret intent after all.

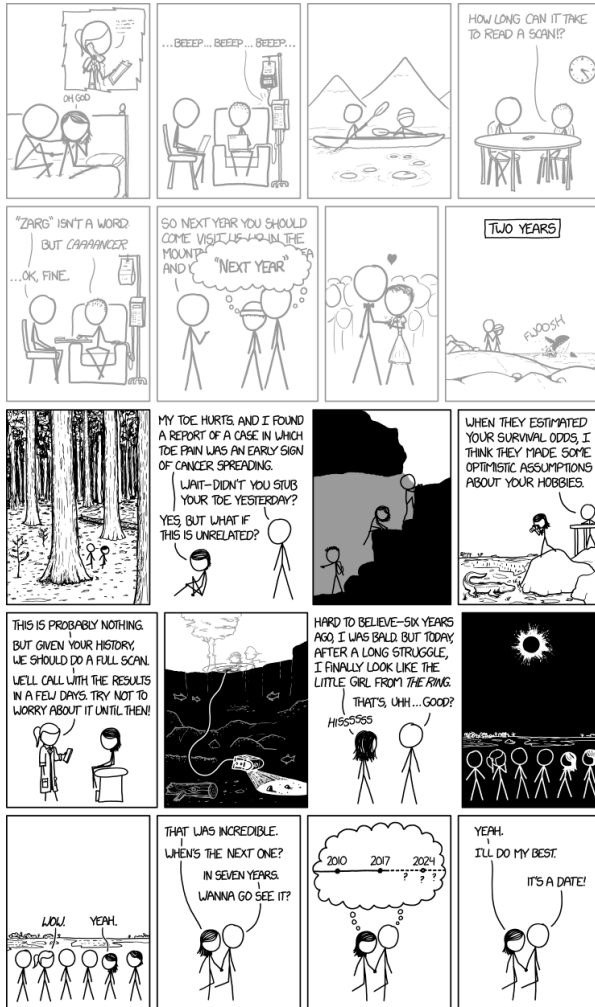
Randall may be satirizing people who use Tinder (and other similar social apps) by portraying an extreme caricature of a Tinder user.

This comic is similar to 1897: Self Driving, and as well as 582: Brakes, which also is about bad ways to get help in emergencies and other time-critical situations.

Note that the photo is at an angle, but the view out of the window shows the airplane to be in level flight. This could be due to haste taking the picture, or a feigned haste in taking the picture, or could suggest that, for whatever reason, the photo is making the situation seem worse than it is.

#1928: Seven Years

December 13, 2017



[hair in face] "SEVVVENNN YEEEEARRRSSS"

Explanation

Randall's then-girlfriend, now-wife, was diagnosed with cancer in late 2010, a matter he has discussed in the comic multiple times before. Here, motivated by the seven years between the American solar eclipses of 2017 and 2024, we see them reminiscing the seven years before the first eclipse, leaving an open question to what the next seven years will bring.

This comic is part of a series of comics and directly continues 1141: Two Years, which is shown as the first eight panels, slightly grayed out. It later continued in 2386: Ten Years.

It was released as a response to another cancer diagnosis, this is explained in the Header text, which, for this comic only, has replaced the standard xkcd updates every Monday, Wednesday, and Friday. The header for this comic, with the active link included, is:

Kate Beaton is the creator of the web comic Hark! A Vagrant. Although this comic is not one on Randall's list of Comics I enjoy, he is clearly much influenced by another cancer diagnosis among someone in his own creative field. Unfortunately, according to the website, Becky Beaton had passed away in 2018.

Explanations of the individual panels:

- Panels 1–8: See 1141: Two Years, where there are also three more panels, not included here, with the punch

line for that comic.

- Panel 9: Randall (drawn as Cueball) and Randall's wife (with her hair noticeably longer than it was at the end of 1141: Two Years, so she looks like Megan), are walking through a forest with very tall trees (maybe giant redwood). The perspective is from a distant vantage point, and themes of extreme longevity are mixed with new growth: The old trees are so tall they grow out of the frame, yet saplings are clearly growing as well. Importantly, they are literally "not out of the woods yet," the very question that was posed to them at the start of 931: Lanes.
- Panel 10: Randall's wife is sitting down, not in the forest anymore. She is concerned because she has pain in her toe and worries that this is an early sign of her cancer spreading again. Randall points out the simpler explanation- that she stubbed her toe the previous day, and the pain is likely a result of that. This panel shows the paranoia that comes from cancer remission, as earlier explained in 931: Lanes.
- Panel 11: Randall and his wife are going spelunking (aka caving). Their guide, Hairy, is gesturing deeper into the cave while Randall and his wife are climbing down. It is the first of three frames that contrast darkness and light, and two frames center on exploring a dark underworld.
- Panel 12: Randall's wife stands on a rock above an alligator in a swamp, photographing the alligator. Randall, on a balcony behind safety railings, observes that medical predictions about the odds of someone

surviving cancer generally assume that the cancer patient doesn't risk something else killing them first. In this case her extreme hobbies (not related to Randall's hobbies).

- Panel 13: Randall's wife sits on an examination bed, listening to a doctor Ponytail holding a clipboard. The doctor talks about an issue which is "probably nothing" but might be the cancer — again showing the paranoia that comes with cancer. Ponytail tells her not to worry about until they have the result of a full scan she will order for her. This could be a full body PET scan to ensure there are no active lymph nodes. If there are this could be caused by metastasis of the cancer to the lymphatic system, which could be difficult to cure. In the first comic we see that it is very difficult to wait for the reply of such a scan.
- Panel 14: Randall and his wife stand above a deep pond full of fish and other objects. Randall's wife is piloting a wired underwater camera with lights. Randall shared pictures of his underwater ROV before. If this panel can be taken as following directly after the previous, it could be concluded that after some years they have learned to go do something fun rather than sit and worry for a result that they cannot change and do not know when will arrive. That would be a positive take on the sequence. They are shown both literally and figuratively searching -- as in the cave -- in the dark unknown. In the same way the doctor in the previous frame was exploring his wife's body, searching for hard to find things at depth.

- Panel 15: Randall and his wife are standing next to each other. Randall's wife has shoulder-length hair covering most of her face, and observes that, despite the chemotherapy robbing her of most of her hair six years ago, it is now growing enough to obscure her face. "The little girl from *The Ring*" refers to Sadako Yamamura, the antagonist of the *Ring* series by Koji Suzuki, and popularized in a 2002 movie. See the title text,
- Panel 16: A line of six people, Ponytail between two other Cueball-like characters as well as Randall and his wife, with Megan to the right, stand and watch the corona of the Sun during the totality of the total solar eclipse of 2017. This has already been mentioned in several comics earlier in 2017, where this solar eclipse passed over the entire continental USA. Thematically, all three dark frames (cave, pond, and eclipse) are without speech. In this dark frame, exploration is replaced with awe, and when light comes in the next frame, speech returns and, in the light of day, determination to move forward.
- Panel 17: The sky has been brightened, and the eclipse is over. As the eclipse is cool to see in person (as Randall made clear in 1880: *Eclipse Review*), the onlookers are left with little more than exclamations of amazement, one of which comes from Randall's wife, which 7 years ago had not expected, or even thought that she would be here to watch it (or a bit earlier, had doubted that she would be!)
- Panel 18: Randall and his wife are walking together and holding hands. When his wife inquires about the next

total eclipse, Randall replies that the next one is in seven years (2024), and asks whether they should go to see it.

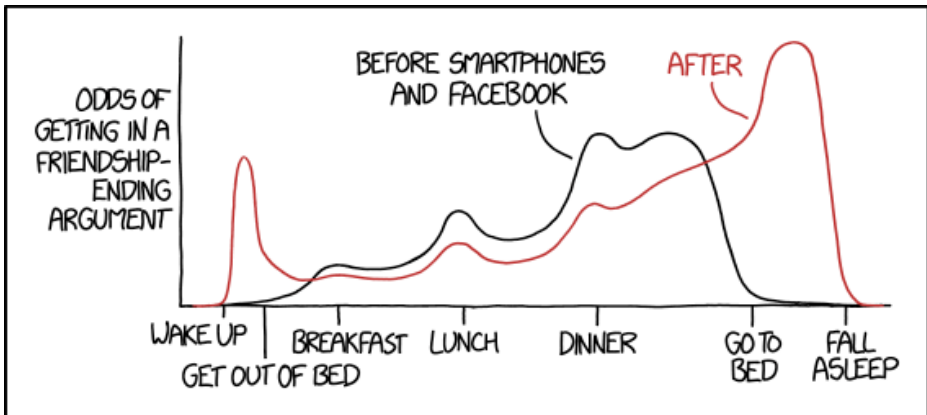
- Panel 19: Still walking, Randall and his wife think together about a timeline. Seven years have passed since 2010, represented with a solid line from the past to 2017; seven years in the future will be 2024, represented with a dotted line into the future and surrounded by three question marks. This is reflective of Panel 6, where "next year" is not guaranteed to be a thing.
- Panel 20: The pair keeps walking, with his wife optimistically agreeing to this stating that she will do her best to accomplish this, and Randall states that they have a date! (His way of claiming her to still be there in seven years!) His affirmation of something so simple as a "date" highlights the contrast to the natural awe of an eclipse or the staggering diagnosis of cancer, and it simultaneously elevates the event to a much higher accomplishment.

The title text is a continuation to panel 15 concerning the horror movie *The Ring*. Specifically, watching the videotape in *The Ring* is supposed to kill a person in seven days, but the title text instead says "seven years".

With all these thoughts in mind, there is no wonder that he wishes to participate in helping a colleague's cancer-stricken sister with the unique header text above this comic, as mentioned above.

#1929: Argument Timing

December 15, 2017



Of course, everyone has their own profile. There are morning arguers, hangry arguers, meal-time arguers, late-night arguers, and people who get in a meta-argument over what their argument timing is, dredge up examples of past arguments, and end up fighting over **THOSE** again as well.

Explanation

This comic comments on how (a) the prevalence of using mobile devices in bed, combined with (b) burgeoning use of social media, especially Facebook, has increased the potential for conflict by encouraging early morning and late night communications, when those involved may not be at their most clear-headed.

Before mobile devices were common, the ability to argue on-line usually ended when a person left their computer to go to bed. Before social media was common, arguments with friends would mostly occur in person or during a phone call. The 'old-fashioned' cycle for arguing suggests that the odds start at near zero, because most people didn't interact with others immediately after waking up unless they lived together, and even then were unlikely to get in arguments first thing in the morning. The frequency increased as the day went on, with peaks at breakfast, lunch and dinner, and a final peak in the evening. This likely indicates that people would frequently share meals with friends and loved ones, then spend time together in the evenings, meaning those times had the most potential for conflict. As the evening ended, the odds fell away dramatically, becoming very low by bedtime, and effectively zero immediately afterward.

The red line, indicating argument frequency with mobile devices and social media, has a similar trend, but is distorted by massive peaks between waking up and

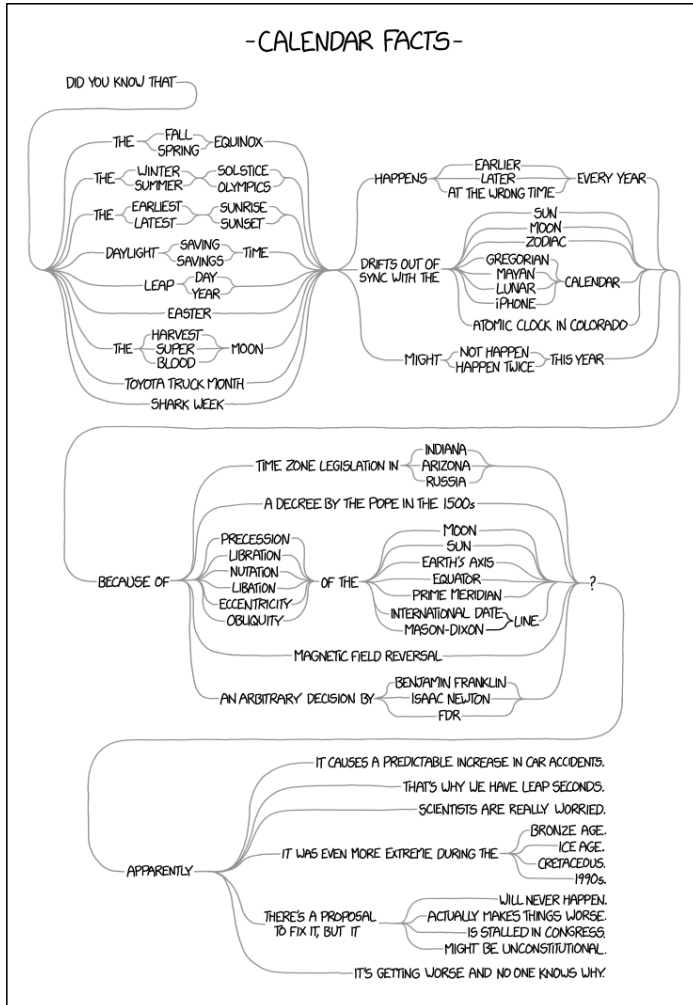
getting out of bed, and then between going to bed and going to sleep. This suggests that, in Munroe's experience, most relationship-ending arguments in modern times happen over social media and electronic communication, while still in bed. It's not clear whether this indicates people primarily using their devices in bed, or just that people tend to get into arguments more while posting in bed (possibly making less inhibited and diplomatic comments due to fatigue). It could also be that people objecting to their partners using social media in bed is also contributing to the number of arguments. Interestingly, this line indicates the chances of conflict in the mobile/Facebook era remains above zero for a short time after one goes to sleep. This may suggest that Randall sometimes falls asleep while writing a social media post but finishes it while sleep-typing, or it may be that he is prone to sending out ill-considered messages just before going to sleep, which are only later picked up, unwelcomed, by the recipient.

The title text talks about different types of arguers, saying that some people argue more at certain times, or in certain states. "Hangry" is a portmanteau of "hungry" and "angry", meaning bad-tempered or irritable as a result of hunger.

490: Morning Routine covers similar ground to this comic.

#1930: Calendar Facts

December 18, 2017



While it may seem like trivia, it causes huge headaches for software developers / is taken advantage of by high-speed traders / triggered the 2003 Northeast Blackout / has to be corrected for by GPS satellites / is

now recognized as a major cause of World War I).

Explanation

This is the second comic using Facts in the title.

Randall presents what appears to be a generator of 156,000 facts $[20 \times 13 \times (8 + 6 \times 7) \times 12]$ (780,000 if including the title text) about calendars, most of which are false or have little meaning.[citation needed] The facts are seeded by a mishmash of common tidbits about the time of year.

The formula for each generated fact goes as follows: "Did you know that [a recurring event] [occurs in an unusual manner] because of [phenomena or political decisions]? Apparently [wild card statement]." The title text adds on as follows: "While it may seem like trivia, it [real-life consequence]."

This is the fifth time that Randall has referred to the phenomenon of a supermoon, which he typically makes fun of, most prominently in 1394: Superm*n.

The title text continues the chart with supposed real-life consequences of the trivia in the comic.

There are multiple online generators of Calendar 'facts' using this formula here and here.

All 156 000 possible combinations can be found here, lovingly assembled by hand (or rather, by a Python script) for your entertainment. A random fact generator (including title text), written in Python, can be found

here.

#1931: Virtual Assistant

December 20, 2017



I WANT TO HACK THE WORLD'S SMART HOME DEVICES, BUT NOT TO CREATE A BOTNET OR ANYTHING—I JUST WANT TO MAKE THEM PLAY THIS SOUND CLIP EVERY TIME YOU INVOKE THEM.

If you ask it to please turn off that feature, it apologizes a whole bunch and promises to try to be quieter, then switches to a slightly lower-volume version of the clip with "sorry!" after the louder sounds.

Explanation

Megan invokes her smart device's virtual assistant with the phrase "Ok Google", intending to follow up with a voice command (e.g., "Check the weather forecast" or "Order two tons of creamed corn"). But before she can continue, the smart device interrupts her with a comical cacophony of assorted noises, as a supposed assistant living in the device clumsily rushes from a distant room to Megan's location. The sounds can be interpreted as: tromping down stairwells, knocking over a fragile antique, opening a locked door, taking a quick pit stop in the bathroom, going back through the door, running across another hardwood floor, opening, and slamming another door, and finally running up to Megan, greeting her while clearly being out of breath.

The idea of a product that is (in reality) a virtual assistant[citation needed] being an actual person with physical form was featured a few days before this comic on Live from Here on December 16, 2017, in a segment in which Amazon.com and its virtual assistant Alexa were satirized as "Amazon Lazy", which delivered the user things that were already in the user's home -- or simply carried the user from one room of the house to another. (Video here)

Randall is amused by the idea that such a "virtual" assistant made "real" might be rather clumsy. In fact, Randall finds the concept so humorous that he would like to troll smart device owners by hacking and

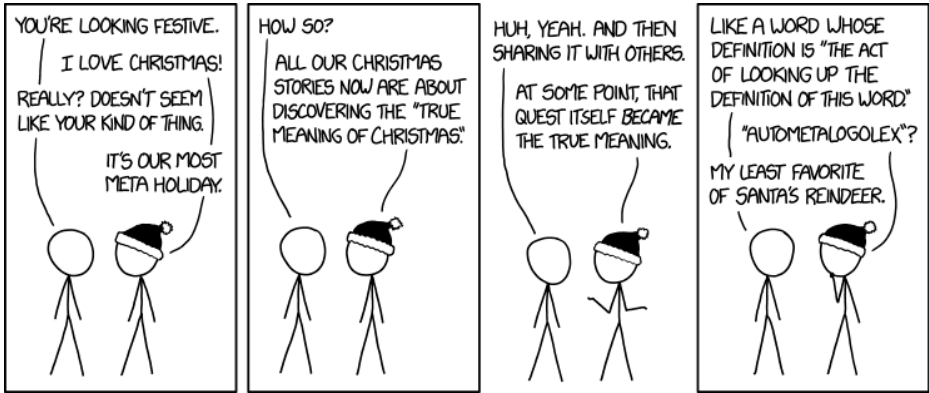
re-programming their devices to play this sound file whenever the VA is invoked. He makes it clear that he doesn't want to create a botnet with them, perhaps in reference to the infamous Mirai attacks of 2016, whose creators pled guilty in court a week before the comic was posted. Another similar activity that is gaining popularity is hacking IP webcams with embedded speakers for comedic purposes (here's a YouTube channel).

The title text extends the concept further. If the owner attempts to disable the feature, rather than refrain from playing the clip, the virtual assistant apologetically promises to be quieter next time; thereafter, the device plays a modified version of the clip where the noises are only slightly diminished and punctuated with additional apologies from the live-in assistant. Randall has characterized the assistant as being incapable of answering without causing a ruckus.

A previous comic, 1897: Self Driving, also toys with the idea that AI is actually just people behind-the-scenes. Sounds of things falling over and breaking off-screen is a comedic trope used in movies. The idea of making it look as if excessive work is put in to being ready to answer the user may be a reference to the Monty Python "it's" man.

#1932: The True Meaning of Christmas

December 22, 2017



They all made fun of Autometalogolex, but someday there will be a problem with Christmas that can only be solved if Santa somehow gets a serious headache, and then they'll see.

Explanation

This is the first of two Christmas comics in a row celebrating Christmas of 2017. The next being 1933: Santa Facts, released upon Christmas Day itself. This was the first time that a year with two Christmas comics had one released as early as December 22nd. Otherwise, it has always been in the range from December 23-26th. (As of 2023 it is still the only such comic released on the 22nd. In 2023 this was also the last release day before Christmas, but the earlier date was not specifically Christmas-themed that year.)

It is making fun of the common trope in popular media that the true meaning of Christmas is about family, friends, and sharing the Christmas Spirit. It subverts the trope by suggesting that once the stories of the "True Meaning of Christmas" become sufficiently common, the real true meaning becomes to spread those stories. Thus the search for the "True Meaning of Christmas" is itself the meaning of Christmas, in a sort of "the journey is the reward" discovery.

In the last panel and title text, "Autometaloglex" is a neologism of Randall's, which can be broken down to its various prefixes and the root:

Thus, "Autometaloglex" would literally mean "A word that refers to itself in the dictionary," or more precisely "the act of looking up the definition of autometaloglex", which leads to a recursion, as all meaning of Christmas

stories do. Recursion and self-reference is a recurring theme in xkcd.

The term Autometaloglex might also refer to autological words, words that refer to a property of the word itself. ("noun" is a noun, "pentasyllabic" is pentasyllabic [has 5 syllables]). "Autometaloglex" is a 'meta' version of the looking up (lex) of an autological word.

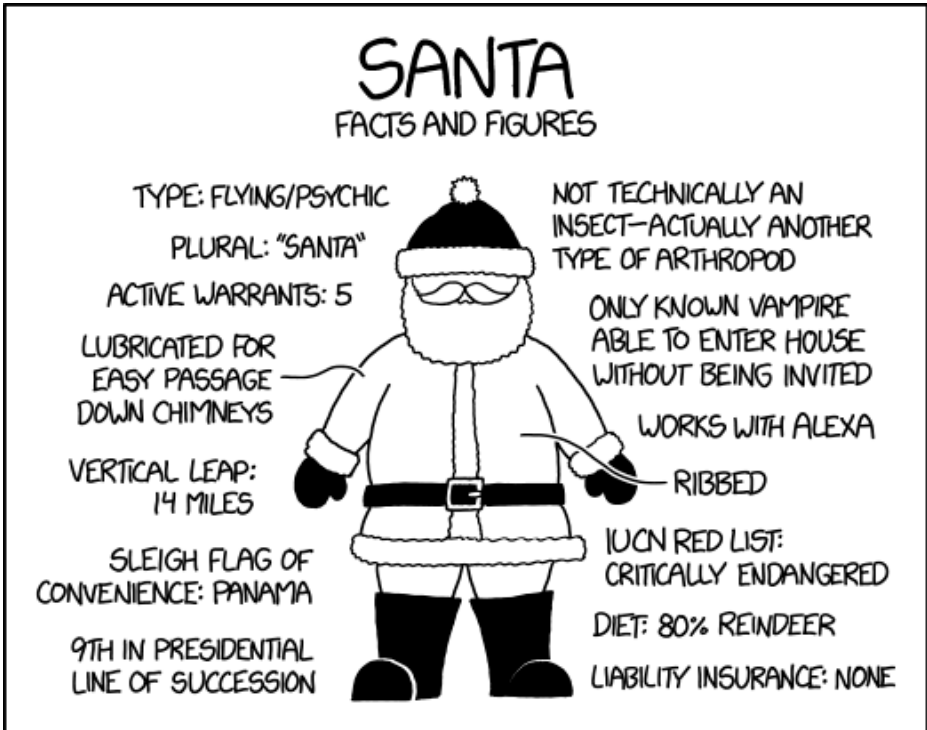
Cueball finally states that Autometaloglex is his least favorite of Santa Claus's reindeer. This is not among the commonly quoted list of names, that are Dasher, Dancer, Prancer, Vixen, Comet, Cupid, Donner, and Blitzen (although, originally, the last two were known as Dunder and Blixem). There exist various other notable, but less famous, reindeer name-lists that also do not feature this; though, being unfavored, perhaps Autometaloglex was never taken out to be popularized by any of the main chroniclers.

The title text reveals this ninth reindeer as a possible equivalence to Rudolph the Red-Nosed Reindeer, who was not accepted by the others until Santa had problems that only Rudolph could solve, and asked it to lead the other reindeer pulling the sleigh (despite being previously not highly regarded by them). In this case, implies that the effective outcome of Autometaloglex is one in which a headache is given to Santa, for some unstated but apparently necessary reason. As headaches generally are bad,[citation needed] this might be why Autometaloglex is not normally favored by Santa. But -

as in a typical Christmas story, here driven into the absurd realm - should Santa ever desperately need a headache in order to fulfil his seasonal duties, then Autometaloglex would be there to save the day.

#1933: Santa Facts

December 25, 2017



We've gotten him up to 20% milk and cookies through an aggressive public campaign, but that seems to be his dietary limit. Anything above that and he starts developing nutritional deficiencies.

Explanation

This was the second Christmas comic in a row after 1932: The True Meaning of Christmas. It was released on Christmas Day in 2017

The comic provides some dubious "Facts" and "Figures" of the creature known as "Santa". We can see from the drawing that this is obviously meant to be either Santa Claus or a parody of Santa Claus. It is the third comic using Facts in the title. Another fact comic was released six years later as the Christmas Day comic of 2023: 2872: Hydrothermal Vents. Here it was an Ocean fact about the demise of Santa Clauses...

This comic is reminiscent of the xkcd Phones series.

Type: Flying/Psychic

Plural: "Santa"

Active warrants: 5

Lubricated for easy passage down chimneys

Vertical Leap: 14 Miles

Sleigh Flag of Convenience: Panama

9th in Presidential Line of Succession

Not technically an insect — actually an arthropod

Only known vampire able to enter house without being invited

Works with Alexa

Ribbed

IUCN Red List: Critically endangered

Diet: 80% Reindeer

Liability Insurance: None

The title text states that as a result of intervention Santa's diet is now 20% milk & cookies, implying that previously it was 100% Reindeer. It is a tradition to leave out milk and cookies as a "gift" for Santa. If he is indeed a vampire, it is odd that Santa could survive on a diet of reindeer, milk, and cookies, since vampires supposedly need human blood to survive. Of course, his entering without being invited already shows Santa to be a highly unusual vampire. Additionally, it is possible that he consumes reindeer blood as part of his reindeer diet (vampires living off animal blood is not unheard of in modern fantasy). Related to that may be the observation that he seems to develop "nutritional deficiencies" when going below 80% reindeer meat, as that would logically result in him consuming less blood and thus starvation due to his vampiric nature.

#1934: Phone Security

December 27, 2017

SECURITY OPTIONS

- ☐ PASSCODE TO UNLOCK (SET CODE)
- ☐ ERASE PHONE AFTER TEN FAILED UNLOCK ATTEMPTS
- IF STOLEN, PHONE CAN BE REMOTELY
 - ☐ TRACKED
 - ☐ ERASED
 - ☐ DETONATED
- ☐ IF PHONE IS STOLEN, ERASE DATA AND PLAY AN EARSPLITTING SIREN UNTIL THE BATTERY DIES OR IS REMOVED
- IF PHONE IS STOLEN, DO A FAKE FACTORY RESET. THEN, IN THE BACKGROUND...
 - ☐ ...CONSTANTLY REQUEST DOZENS OF SIMULTANEOUS RIDESHARES TO THE PHONE'S LOCATION
 - ☐ ... AUTOMATICALLY ORDER FOOD TO PHONE'S LOCATION FROM EVERY DELIVERY PLACE WITHIN 20 MILES
 - ☐ ... IF THIEF LOGS IN TO FACEBOOK, SEND HOSTILE MESSAGES TO ALL THEIR FAMILY MEMBERS
 - ☐ ... AUTOMATICALLY DIRECT SELF-DRIVING CAR TO DRIVE TOWARD PHONE'S LOCATION AT 5 MPH
 - ☐ ...TAKE PHOTOS OF RANDOM OBJECTS AT THE THIEF'S ADDRESS AND POST THEM AS "FREE" ON CRAIGSLIST AND NEXTDOOR

...wait until they type in payment information, then use it to order yourself a replacement phone.

Explanation

This comic pokes fun at various phone security measures. At first, it covers some real measures, and then continues on to measures that are clearly somewhat overzealous or otherwise humorous. It is worth noting that all of the options are turned ON in the screen shown, so apparently the owner must be very afraid that their phone is going to be stolen, or just wants to see what will happen.

These may be options that would appear on the xkcd Phone, but that is not mentioned specifically, and this comic does not appear to be directly linked.

The first two options: Set Passcode to Unlock, and Erase phone after 10 failed unlock attempts are both real security measures found on many phones. The remaining options would rely on the fact that the phone could sense that it is stolen:

If stolen, phone can be remotely... The items on this sub-heading indicate the requirements of a separate device (i.e. the owner's laptop). The phrasing leaves it ambiguous whether they are only available when it is sensed to be stolen, or if they are simply indicators of whether the owner can perform the given actions when activated.

- Tracked: This would allow the police to catch the perpetrator and return your phone. This function is available on most modern phones in general but not

bound to a specific situation.

- Erased: This would prevent any sensitive data from being taken by a thief. This function is also available on most modern phones.
- Detonated: This would likely harm the thief, possibly severely, depending on how the phone was detonated. The main problem with this approach (ignoring the possibility of manslaughter), is that if the phone is capable of detonation it's possible, by accident, glitch, or a malicious hacker, that the phone could detonate when not stolen, possibly hurting or killing the rightful owner. It is also possible for the detonation to harm innocent people who happen to be nearby when the feature is triggered. Phone batteries may produce an explosion if their temperature rises high enough, and contain circuitry both inside the battery and inside the logic of the phone to prevent this.

If the phone is stolen, play an earsplitting siren until the battery dies or is removed: This would be to draw attention to the thief, and discourage them from stealing future phones. Noticeably, it does not specify how the phone determines it is stolen, and, similar to the "detonate" option above, this has the potential to be an irritation if it is activated by accident, glitch, or hack.

If the phone is stolen, do a fake factory reset. Then, in the background...: This series of options is all humorous, indicating that the phone would allow the thief to think that it had factory reset, but the phone would, in fact, not do so, and would instead annoy the thief by doing

various horrible things to them.

- ...constantly request dozens of simultaneous rideshares to the phone's location: This would cause tons of "rides" to show up at the stolen phone, leaving a lot of annoyed ridesharers, and possibly alerting the police to the thief's location. The thief may begin developing serious paranoia.
- ...automatically order food to the phone's location from every delivery place within 20 miles: This would be similar to the ridesharing issue, except it would be implied that the thief would be on the hook to pay for all of that delivered food. If not, this might arguably be the worst option in this menu, since not only would the owner of the phone have their phone stolen, they would also have hundreds of dollars of delivery bills. This could also lead the police to the thief.
- ...if the thief logs into Facebook, send hostile messages to all their family members: This has now deviated from things that could even possibly be useful, and is now just getting revenge on the thief, or potentially the person that the thief sells the phone to.
- ...automatically direct self driving car to drive toward the phone's location at 5 mph: This would cause a self driving car to follow the thief at a moderate jogging speed, or to run them over when the running ceases. This could absolutely catch the thief, but would also just be really, really creepy.
- ...take photos of random objects at the thief's address and post them as "Free" on Craigslist or NextDoor:

Craigslist and NextDoor are sites that allow people to post advertisements for various things. Posting a large number of things for free would cause a lot of people to show up at the thief's residence, which can be found via GPS, requesting the free things, or, more humorously, if the thief was not home, people may just come by and take things, causing them to steal from the thief. This would be a humorous form of poetic justice.

The title text extends the last category with: ...wait until they type in payment information, then use it to order yourself a new phone. If the thief used the thief's own payment information, then this would be the ultimate in poetic justice, as it would basically say that the user does not care if their phone gets stolen, because the thief will end up unintentionally buying them a new one. If the thief were to complain about this, they would have to admit that they had stolen the first phone in order to do so, which they would be disinclined to do. However, if the thief used fraudulent or stolen payment information (whether stolen by the same thief or acquired online), then the replacement phone would be purchased with the payment information of the other victim, and when that person complained, the owner of the stolen phone would appear to be the person who stole the payment information, and might be arrested for that theft. This is a very, very bad idea.[citation needed]

Note that all of these security measures, with the possible exception of the remote detonation, could theoretically be done by a security app on a typical smartphone, although the fake factory reset and most (if not all) of

what follows would likely require a phone to be rooted and have a custom operating system installed. With the advent of open source phones such as the Librem 5, tricks such as these have become much easier for the average programmer to implement, and some may already exist in the wild. (Even the remote detonation might be possible on some phones that prevent battery explosions with software rather than physical circuitry.)

#1935: 2018

December 29, 2017



We should really start calculating it earlier, but until the end of December we're always too busy trying to figure out which day Christmas will fall on.

Explanation

In this, the first of two New Year comics in a row, Megan wonders whether 2018 will be a leap year. Cueball thinks 2018 will not be a leap year, and Megan responds that she "doubts anyone knows at this point." This appears to be a jab at people who suggest that anything they don't know is generally unknown. As Cueball says, leap years occur every four years (though there are a few exceptions - a year divisible by 100 is not a leap year, unless it is also divisible by 400), adding an extra day to account for the fact that Earth takes a bit longer than 365 days to orbit the Sun. Therefore, most years that are a multiple of four are leap years. As Megan says, this is easy for odd-numbered years, since no odd numbers are divisible by four. However, according to Megan, for even-numbered years, it isn't quite as simple. However, it is still easy for general even numbers as well, as whenever the last two digits are divisible by 4, the whole number is, since 100 is divisible by 4. In this case 18 isn't divisible by 4, therefore, 2018 isn't.

The last panel expresses a misunderstanding of modern public-key cryptography, which relies on the fact that it is difficult to factorize large numbers. Megan is applying this concept to the year, claiming that it is hard to determine whether or not 2,018 is a multiple of four and hence is a leap year. In reality, factorization is not needed here, since we already know the factor in question, which is four. Megan states that, if it were possible to factor large numbers with a calculator, modern cryptography

would collapse. While true, it is true only for truly large numbers (hundreds of digits), and no factorization is needed in this case.

At the end of the strip, Megan hopes the answer can be brute-forced by February. Brute force is a method of breaking cryptography by trying every possible option until one works. This is misdirection upon misdirection, in that, even if we needed to factorize 2,018 (which we don't), the simplest brute-forcing algorithm would need to try only 14 numbers -- each prime from 2 to 43 (the square root of 2,018 is closest to 44). In cryptography, the algorithms use numbers much, much bigger than 2,018 -- on the order of hundreds or even thousands of digits.

The title text refers to calculating which day Christmas will fall on. As Christmas always lands on December 25 by definition, the day of the week varies from year to year, though it's always the 359th or, in leap years, the 360th day of the year. Still, determining which day of the week December 25 lands on is not a difficult problem to solve, requiring only a few mathematical operations to compute. Alternatively, this might be an oblique reference to Easter, the date of which jumps from year to year according to a multi-layered algorithm that most people don't know. The changing date of Easter was recently included in 1930: *Calendar Facts*. Additionally, uncertainty with the regard to the date of Christmas has also been referenced in 679: *Christmas Plans*.

A handy coincidence to help with this problem for those

living in America or following American politics is that leap years fall on presidential election years.

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